May 6, 2010

MEMORANDUM

To: Massaponax WWTF (VA0025658)

From: Anna T. Westernik, Water Permit Writer

Subject: VPDES Permit Modification to Expand the Facility Design Flow from 8.0 MGD to 9.4 MGD

This memorandum and its attachments serve as a supplement to the fact sheet drafted on April 18, 2007 that accompanied the VPDES permit effective on August 21, 2007 (**Attachment 1**) and as the documentation and rationale for a permit modification to the Massaponax WWTF permit. The modification adds 1.4 MGD of additional design flow to the Massaponax WWTF and removes the equivalent flow from the FMC WWTF, also under the purview of Spotsylvania County. The modification was requested by Edward Petrovitch, Director of Utilities for Spotsylvania County, by letter dated August 12, 2009.

The nutrient concentration permit limits for the current 8.0 MGD design flow tier are based upon an April 19, 2001, Water Quality Improvement Fund Grant Agreement made between DEQ and Spotsylvania County for the upgrade of the Massaponax WWTF. The grant set a goal of 8.0 mg/L for total nitrogen concentration. At that time, the treatment plant was designed to meet a phosphorus concentration of 2.0 mg/L based on the then current Policy for Nutrient Enriched Waters. The proposed nutrient concentration permit limits for the 9.4 MGD design flow tier are based upon the waste load allocations established in the Water Quality Management Planning Regulation at 9 VAC 25-720-70.C. The nutrient concentrations for the Massaponax WWTF are as follows:

Design Flow Tier (MGD)	Total Nitrogen Calendar Year (mg/L)	Total Phosphorus Calendar Year (mg/L)
8.0	8.0	2.0
9.4	4.0	0.3

The Virginia Institute of Marine Science (VIMS) Model run in December 2010 shows that the changes in flow will not have a detrimental effect on near-field water quality (**Attachment 2**). Spotsylvania County has an aggregated nutrient waste load allocation for the Massaponax WWTP and FMC WWTP. This permitting action does not change the aggregated, or bubbled, allocation for Spotsylvania County as contained in Registration List for the Chesapeake Bay watershed general permit at 9 VAC 25-820-70. Essentially, the nutrient waste load allocation associated with the 1.4 MGD flow will be transferred from the FMC WWTF to the Massaponax WWTF, while the overall allocation to the County remains unchanged. FMC shall not be allowed to expand to the 5.4 mgd flow tier shown in their current VPDES permit since the nutrient loadings allocated for the FMC 5.4 mgd flow tier will be transferred to the Massaponax WWTF when the expansion to the 9.4 mgd flow tier occurs (see Special Condition No. 13 in the permit).

Anti-Backsliding

Addition of the 9.4 MGD flow tier in the Massaponax WWTF VPDES permit does not constitute backsliding because the equivalent nutrient loading will be removed from the FMC permit, and permit effluent limits for the Massaponax WWTP at the higher flow tier are not relaxed.

Public Notice Information:

First Public Notice Date: June 28, 2010 Second Public Notice Date: July 5, 2010

Public Notice Information is required by 9 VAC 25-31-280 B. All pertinent information is on file and may be inspected and copied by contacting the: Northern DEQ Regional Office, 13901 Crown Court, Woodbridge, VA 22193, Telephone No. (703) 583-3837, anna.westernik@deq.virginia.gov. See **Attachment 3** for a copy of the public notice document, and the public notice period.

Persons may comment in writing or by e-mail to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing if public response is significant. Requests for public hearings shall state the reason why a hearing is requested, the nature of the issues proposed to be raised in the public hearing and a brief explanation of how the requester's interests would be directly and adversely affected by the proposed permit action. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given.

EPA Checklist:

The EPA Checklist is **Attachment 4**.

LIST OF ATTACHMENTS

Attachment 1	Fact Sheet from 2007 Permit Reissuance
Attachment 2	March 2010 VIMS Model Summary
Attachment 3	Public Notice
Attachment 4	EPA Checklist

This document gives pertinent information concerning the VPDES Permit listed below. This permit is being processed as a Major, Municipal permit. The discharge results from the operation of an 8.0 mgd wastewater treatment plant. The effluent limitations and special conditions contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260-00 et seq.

1. Facility Name and Address: Massaponax WWTF
600 Hudgins Road
Fredericksburg, VA 22408

SIC Code : 4952

Facility Location: 10900 HHC Drive, Routes 2 & 17
Fredericksburg, VA 22408

County: Spotsylvania

2. Permit No.: VA0025658

Expiration Date: October 4, 2006

3. Owner Name: Spotsylvania County

Contact/Title: Douglas Crooks, Superintendent of Wastewater

Telephone Number: 540-368-3929, ext. 302

4. Application Complete Date: May 11, 2006

Permit Drafted By: Anna Westernik

Date Drafted: April 18, 2007

Draft Permit Reviewed By: Tom Faha

Date Reviewed: April 27, 2007

Public Comment Period : Start Date: July 21, 2007

End Date: August 19, 2007

5. Receiving Waters Information: See **Attachment 1** for the Flow Frequency Determination

Receiving Stream Name :	Rappahannock River	River Mile:	104.67
Stream Basin:	Rappahannock River	Subbasin:	None
Section:	1	Stream Class:	II
Special Standards:	a	Waterbody ID:	VAN-E20E
7Q10 Low Flow:	Tidal	7Q10 Low Temp. Flow:	Tidal
1Q10 Low Flow:	Tidal	1Q10 Low Temp. Flow:	Tidal
Harmonic Mean Flow:	Tidal	30Q5 Flow:	Tidal
30Q10 Low Flow:	Tidal	30Q10 Low Temp Flow:	Tidal
303(d) Listed:	Yes	TMDL Approved/Date:	No

The Rappahannock River at the point of discharge is tidal. See **Attachment 1** for flow statistics for free flowing waters at the fall line.

6. Statutory or Regulatory Basis for Special Conditions and Effluent Limitations:

- ✓ State Water Control Law
- ✓ Clean Water Act
- ✓ VPDES Permit Regulation
- ✓ EPA NPDES Regulation
- ✓ EPA Guidelines
- ✓ Water Quality Standards
- ___ Other *(PES, Occoquan Policy, Dulles)*

7. Licensed Operator Requirements: Class I

8. Reliability Class: Class I

9. Permit Characterization:

- ___ Private
- ___ Federal
- ___ State
- ✓ POTW
- ___ Effluent Limited
- ✓ Water Quality Limited
- ✓ Toxics Monitoring Program Required
- ✓ Pretreatment Program Required
- ___ Possible Interstate Effect
- ___ Compliance Schedule Required
- ___ Interim Limits in Permit
- ___ Interim Limits in Other Document

TMDL

10. Wastewater Sources and Treatment Description:

Wastewater received from the sewage collection system, septage, and grease are treated at the facility. Septage and grease are trucked into the facility. Four treatment processes are used to remove pollutants from the wastewater: preliminary treatment, secondary treatment, tertiary treatment, and final treatment. Grease is delivered to the treatment system after prelimary treatment. Septage is added to the treatment system before prelimary treatment with the gravity fed influent raw wastewater.

Preliminary treatment consists of a screening system to capture large debris and a grit collecting system that uses settling tanks to separate out coarse and fine grit from the wastewater. The debris and grit are sent to the landfill for disposal. The screened and degritted wastewater is pumped to the secondary treatment process.

The preliminary treated wastewater enters an aeration basin flow distribution box where it combines with return activated sludge (RAS) and metered aluminum sulfate that is added to chemically precipitate phosphorus. From the distribution box flow enters three parallel biological nutrient removal (BNR) basins that aerate and mix the wastewater (secondary treatment).

Each aeration basin is a two stage biological process designed to encourage several varieties of bacteria to grow in sufficiently large populations for the controlled removal of carbonaceous compounds and total nitrogen. The first stage of the biological process is the anoxic zone where microorganisms are encouraged to consume carbonaceous compounds and nitrates; and therefore, release nitrogen gas and alkalinity. The second stage is the aerobic zone where microorganisms are encouraged to convert ammonia to nitrates and to consume carbonaceous compounds.

Nutrients are removed when carbonaceous compounds are absorbed by bacteria, which are removed as waste activated sludge (WAS); ammonia is converted to nitrates and then nitrogen gas, which is released to the atmosphere; and phosphorus is precipitated and removed as WAS due to the addition of aluminum sulfate.

The aeration basin is divided into seven zones (See **Attachment 2** for a schematic of the zones):

1. Anoxic Zone A -- This zone provides an oxygen free environment and is normally used for denitrification. Microorganisms use energy provided by the BOD in the plant influent to consume nitrates in the RAS.
2. Anoxic Zone B – This zone provides an oxygen free environment and is used to extend the denitrification process.
3. The primary swing zone is normally used as an oxic zone.
4. The oxic zone is used to provide an oxygen rich environment for the heterotrophic and nitrifying bacteria. The heterotrophic bacteria consume carbonaceous compounds and the nitrifying bacteria convert ammonia to nitrates.
5. The secondary swing zone is normally used to continue the oxic zone. However, the secondary swing zone may be used as an extension of the deoxy zone.
6. The deoxy zone prevents the recycle pump discharge from contaminating the anoxic zone by depleting the dissolved oxygen concentration of the mixed liquor.
7. The reaeration zone reduces the occurrence of gasification in the secondary clarifiers by adding oxygen to the mixed liquor.

The secondary clarifier flow distribution box receives metered aluminum sulfate and mixed liquor from the three aeration basins. Baffles in the two secondary clarifiers break the flow, and it is evenly distributed to two secondary clarifiers. Phosphorus is removed and solids settling is enhanced through the addition of aluminum sulfate. The floatable solids in the clarifiers are pumped to the WAS storage tanks. Most settled sludge is returned to the aeration basins. A controlled portion of the settled sludge is removed as WAS to prevent excessive solids build-up in the secondary treatment system.

Clarified wastewater flows to gravity sand filters that capture colloidal solids and stray settleable solids (tertiarty treatment). These filters are periodically backwashed. Solids from the backwashing process are sent to the preliminary treatment system. Sodium hypochlorite is added as needed to purge the filters of biological growth.

Flow from the effluent filters discharges to the ultraviolet (UV) flow distribution box for final treatment. This box distributes flow to three channels housing five UV banks. UV light inactivates bacteria and viruses in the wastewater by destroying their genetic material. Sodium bisulfite is also added in the final treatment system to remove residual chlorine from the final effluent. Disinfected wastewater flows to the effluent well and then travels through a cascade aerator prior to discharge.

See **Attachment 3** for a facility schematic/diagram.

TABLE 1 – Outfall Description

Outfall Number	Discharge Sources	Treatment	Design Flow	Outfall Latitude and Longitude
001	Domestic Wastewater	See Item 10 above.	8.0 mgd	38° 15' 20" N 77° 24' 50" W
See **Attachment 4** for the Fredericksburg Quadrangle topographic map (182C) showing Outfall 001 and other discharges in the vicinity of the outfall.				

11. Sludge Treatment and Disposal Methods:

WAS and scum from the aeration basins and secondary clarifiers are pumped to one of three aerated WAS storage tanks. Sludge from the WAS tanks is pumped via belt filter press sludge feed pumps to the belt filter presses. The sludge travels through an in-line mixer where it is conditioned by adding and mixing the sludge with polymer prior to being discharged to the dewatering zone of the belt filter press. The sludge is dewatered by the belt presses. The dewatered sludge is dropped by a conveyor system to a truck.

Sludge is transported in a non-stabilized form via trucks to the Livingston Landfill located at 6241 Massey Road in Spotsylvania County. At the landfill sludge is composted or disposed of in the landfill. All composted sludge is sold as a Class A sludge.

See **Attachment 5** for a solids handling schematic.

12. Discharges, Intakes, Monitoring Stations, Other Items in Vicinity of Discharge

TABLE 2

Rappahannock River Mile (approximate)	Description
113.57	**USGS Gaging Station** (Fredericksburg)
108.64	**Discharge** - City of Fredericksburg WWTF, VPDES Permit VA0025127, Major-Municipal
107.37	**Discharge** - FMC WWTP, VPDES Permit VA0068110, Major-Municipal
107.49	**Tributary with Discharge** - Deep Run. Quarles Petroleum - Fredericksburg Bulk Oil Terminal, VPDES Permit VA0029785, Minor-Industrial.
107.33	**DEQ Sampling Station** - 3RPP107.33.
107.01	**DEQ Sampling Station** - 3RPP107.01.
106.09	**Industrial Water Supply** - GM Power Train Group intake
104.67	**Discharge** - Massaponax STP, VPDES Permit VA0025658, Major-Municipal
104.61	**Discharge** - Little Falls Run STP, VPDES Permit VA0076392, Major-Municipal
104.47	**DEQ Sampling Station** - 3RPP104.47.
	Discharge – Fredericksburg Concrete, VPDES Permit VAG110098, Ready-Mixed Concrete General Permit
	Discharge – Culpeper Wood Preservers – Ruffins Creek, VPDES Permit VA0090468, Minor - Industrial
	Discharge – Titan – New Post Ready Mix. VPDES Permit VAG110106, Ready-Mixed Concrete General Permit
103.95	**Discharge** – Rappahannock Geologic Products, Inc. VPDES Permit VAG846020, NonMetallic Mineral Mining General Permit
103.84	**Tributary with Discharge** - Massaponax Creek. Vulcan Construction Materials, New Post. VPDES Permit VAG846007, NonMetallic Mineral Mining General Permit
	Tributary with Discharge - Massaponax Creek. Vulcan Construction Materials, Spotsylvania. VPDES Permit VAG846045, NonMetallic Mineral Mining General Permit
96.5	**Industrial Water Supply** - VA0087645, SEI Birchwood, Minor-Industrial, 6.6 mgd Maximum intake
96.39	**Discharge** - VA0087645, SEI Birchwood, Minor-Industrial, 0.5 mgd Maximum **Discharge** – VA0090654 Greenhost Farms, Minor-Industrial, 1.0 mgd Maximum
92.87	**Tributary with Discharge** - Unnamed tributary. Mid Atlantic Materials – King George, VPDES Permit VAG846008, NonMetallic Mineral Mining General Permit
91.94	**Tributary with Discharge** - Skinker's Creek. Receiving stream for VA0060429, Four Winds Campground, Minor- Municipal.
91.6	**Tributary with Discharge** - Birchwood Creek. UT, Birchwood Creek. Royster Clark Inc - Sealston . VA0088374, Minor, Industrial
89.8	**Discharge** (proposed) - Hopyard Farm Wastewater Treatment Plant, VPDES Permit VA0089338, Minor-Municipal
85.10	**Discharge** (proposed) - Haymount WWTF, VPDES Permit VA0089125, Municipal-Minor.
80.19	**U.S. Route 301 Bridge at Port Royal**

VPDES Industrial Storm Water General Permits

VPDES Number	Facility Name
VAR050894	**Discharge to Rappahannock River**- M&M Auto Parts, Inc.
VAR050994	**Discharge to Rappahannock River, UT** – Motion Control Industries, Inc.
VAR051010	**Discharge to Rappahannock River** - Trussway, Ltd.
VAR051012	**Discharge to Rappahannock River, UT** – Virginia Paving Company – Fredericksburg Plant
VAR051028	**Discharge to Rappahannock River, UT** – McLane Mid Atlantic
VAR051051	**Discharge to Rappahannock River, UT** – Pepsi Cola Bottling Group - Fredericksburg
VAR051052	**Discharge to Rappahannock River, UT** – United Parcel Service - Fredericksburg
VAR051090	**Discharge to Rappahannock River, UT** – GM Powertrain – Fredericksburg Components
VAR051091	**Discharge to Rappahannock River, UT** – Anderson Oil Company – Bulk Storage Terminal
VAR051422	**Discharge to Rappahannock River** – Massaponax WWTF
VAR051423	**Discharge to Rappahannock River** – FMC WWTF

13. **Material Storage:** See **Attachment 6**. To prevent chemicals stored at the Massaponax WWTF from reaching state waters, a dike is placed around the caustic tank and overflow from the tank is sent to a drain. Any overflow from chemicals stored in barrels is directed to floor drains. The drain discharge goes to a pump station where it is sent to the head of the plant.

14. **Site Inspection:** DEQ-NRO staff performed a technical and laboratory inspection on September 7, 2006. See **Attachment 7** for the Technical Summary. A copy of the full inspection report is included in the 2006 permit reissuance file.

15. **Receiving Stream Water Quality and Water Quality Standards:**

a) Ambient Water Quality Data

The Department of Environmental Quality has numerous ambient water quality monitoring stations on the Rappahannock River. The closest monitoring station, 3RPP104.47, is located approximately 100 yards below the outfall.

The 2006 Virginia Water Quality Assessment 305(b)/303(d) Integrated Report (IR) states that the segments of the Rappahannock River from the fall line to the confluence with Deep Run are classified as 5A. These segments of the Rappahannock River do not support the recreation use (fecal coliform or *E. coli* bacteria), the fish consumption use (PCBs present in fish tissue), and/or they have insufficient submerged aquatic vegetation acreage. Copies of the Fact Sheets are found in **Attachment 8**.

Significant portions of the Chesapeake Bay and its tributaries are listed as impaired on Virginia's 303(d) list of impaired waters for not meeting the aquatic life use support goal, and the 2006 Virginia Water Quality Assessment 305(b)/303(d) Integrated Report indicates that much of the mainstem Bay does not fully support this use support goal under Virginia's Water Quality Assessment guidelines. Nutrient enrichment is cited as one of the primary causes of impairment.

In response, the Virginia General Assembly amended the State Water Control Law in 2005 to include the *Chesapeake Bay Watershed Nutrient Credit Exchange Program*. This statute set forth total nitrogen and total phosphorus discharge restrictions within the bay watershed. Concurrently, the State Water Control Board adopted new water quality criteria for the Chesapeake Bay and its tidal tributaries. These actions necessitate the evaluation and the inclusion of nitrogen and phosphorus limits on discharges within the bay watershed.

b) Receiving Stream Water Quality Criteria

Part IX of 9 VAC 25-260(360-550) designates classes and special standards applicable to defined Virginia river basins and sections. The receiving stream Rappahannock River is located within Section 1 of the Rappahannock River Basin, and classified as a Class II water.

Class II tidal waters in the Chesapeake Bay and it tidal tributaries must meet dissolved oxygen concentrations as specified in 9 VAC 25-260-185 and maintain a pH of 6.0-9.0 standard units as specified in 9 VAC 25-260-50. In the Northern Virginia area, Class II waters must meet the Migratory Fish Spawning and Nursery Designated Use from February 1 through May 31. For the remainder of the year, these tidal waters must meet the Open Water use. The applicable dissolved oxygen concentrations are presented in the table in **Attachment 9a**.

This discharge segment of the Rappahannock is located in the tidal freshwater zone. This zone extends from the fall line of the Rappahannock River to Buoy 37 near Tappahannock. Freshwater, numerical water quality criteria, as opposed to saltwater criteria (excluding dissolved oxygen, pH, temperature, and chlorine), apply to this tidal freshwater zone.

Attachment 9b details other water quality criteria applicable to the receiving stream.

Ammonia. The Water Quality Criteria for Ammonia are dependent on the instream temperature and pH. The 90th percentile temperature and pH values are used because they best represent the critical design conditions of the receiving stream. The 90th percentile pH and temperature values were derived from weekly samples collected by the City of Fredericksburg Department of Public Works staff at the Mayfield Bypass Bridge during the period of January 1991 through May 1995. This station is located upstream of the outfalls for the City of Fredericksburg Wastewater Treatment Plant, FMC Sewage Treatment Plant, Massaponax Sewage Treatment Plant and Little Falls Run Wastewater Treatment Plant. Staff has reevaluated the receiving stream ambient monitoring data for pH and temperature using data collected from DEQ Ambient Monitoring Station 3-RPP104.47 (located 100 yards below the Massaponax WWTF) during the period of February 21, 1991 to December 12, 2006 and finds no significant differences from the pH and temperature values originally used to establish ammonia criteria. The 90th percentile pH and temperature values were found to be 7.5 S.U. and 28°C. See **Attachment 10** for the acute and chronic ammonia water quality criteria calculations.

The seasonal tiers for the Rappahannock River are November through April and May through October. These tiers reflect the division between winter and summer periods relative to temperature in the Rappahannock River. In addition, these tiers are consistent with seasonal tiers for other Rappahannock River dischargers in the Fredericksburg area.

Metals Criteria: The Water Quality Criteria for some metals are dependent on the receiving stream's hardness (expressed as mg/l calcium carbonate). The average hardness of the receiving stream determined through analysis of the STORET data from sampling station 3-RPP104.47 for the period of April 1992 to December 1998 is 30 mg/l. The average hardness of the effluent from all the major wastewater treatment plants in the upper tidal portion of the Rappahannock River ranges from 50 to 112 mg/l. It is intuitive that under design conditions the instream hardness will begin to approach that of the hardness from the wastewater treatment plants. Due to the presence of multiple dischargers in the upper tidal portion of the Rappahannock River and the uncertainty of the mixing zones, staff does not feel it is feasible to perform an accurate mass balance between the hardness of the effluent from the wastewater treatment plants and the receiving stream. A hardness value of 50 mg/l, as recommended by DEQ guidance, should adequately estimate the river hardness under design conditions. This hardness value was used to determine the water quality criteria for metals (**Attachment 10**).

Bacteria Criteria: The Virginia Water Quality Standards (9 VAC 25-260-170 B) states sewage discharges shall be disinfected to achieve the following criteria:

E. coli and enterococci bacteria per 100 ml of water shall not exceed the following:

	Geometric Mean[1]
Fresh; *E. coli*	126
Saltwater [and Transition Zone[2]]	
enterococci	35

[1]For two or more samples taken during any calendar month

[2]See 9 VAC 25-260-140 C for freshwater and transition zone delineation.

(The Rappahannock at the point of discharge is considered fresh water.)

c) Receiving Stream Special Standards

The State Water Control Board's Water Quality Standards, River Basin Section Tables 9 VAC 25-260-360, 370 and 380 designates the river basins, sections, classes, and special standards for surface waters of the Commonwealth of Virginia. The receiving stream, the Rappahannock River, is located within Section 1 of the Rappahannock Basin. This section has been designated a Class II water with a special standards of a.

The receiving stream has been designated with a special standard of "a". Although the area has a shellfish designation, there are no known shellfish beds in the upper tidal Rappahannock. According to 9 VAC 25-260-310.1, Special Standard a applies to waters capable of propagating shellfish and to waters where shellfish beds are present, including those waters on which condemnation or restriction classifications are

established by the State Department of Health. The fecal coliform bacteria standard is as follows: the median fecal coliform value for a sampling station shall not exceed an MPN (Most probable number) of 14 per 100 milliliters of sample and not more than 10% of the samples shall exceed 43 for a 5-tube, 3-dilution or 49 for a 3-tube, 3-dilution test. This same standard is also contained in 9 VAC 25-260-160. Fecal Coliform Bacteria; Shellfish Waters. This standard is used for the interpretation of instream monitoring data and not for setting fecal coliform effluent limitations.

d) Threatened or Endangered Species

The Virginia DGIF Fish and Wildlife Information System Database was searched for records to determine if there are threatened or endangered species in the vicinity of the discharge. The following threatened or endangered species were identified within a 2 mile radius of the discharge: Bald Eagle. The limits proposed in this draft permit are protective of the Virginia Water Quality Standards and therefore, protect the threatened and endangered species found near the discharge.

The stream that the facility discharges to is within a reach identified as having an Anadromous Fish Use. It is staff's best professional judgment that the proposed limits are protective of this use.

16. Antidegradation (9 VAC 25-260-30):

All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

Staff has determined that the segment of the Rappahannock River into which the Massaponax WWTF discharges (Segment 9) is a Tier I water for the following reasons:

1. The waters are designated as nutrient enriched.
2. The chlorophyll a concentrations in the receiving water are high.
3. Turbidity measurements from ambient monitoring indicated high turbidity.
4. The segment from the fall line at Route 1 to the confluence of Deep Run with the Rappahannock River is listed as category 5A water in the 2006 IR. This segment does not support the Recreation Use (Fecal Coliform or *E. coli* bacteria), the Fish Consumption Use (PCBs in Fish Tissue) and the Aquatic Life Use (SAV).
5. The August 2006 run of the VIMS Model for the Rappahannock River indicates that the dissolved oxygen for migratory fish waters will not significantly exceed the new 6.0 mg/l criteria.

For Tier 1 waters, antidegradation is addressed by ensuring that the effluent limits result in compliance with the water quality standards.

17. Effluent Screening, Wasteload Allocation, and Effluent Limitation Development :

To determine water quality-based effluent limitations for a discharge, the suitability of data must first be determined. Data is suitable for analysis if one or more representative data points are equal to or above the quantification level ("QL") and the data represent the exact pollutant being evaluated.

Next, the appropriate Water Quality Standards are determined for the pollutants in the effluent. Then, the Wasteload Allocations (WLA) are calculated. The WLA values are then compared with available effluent data to determine the need for effluent limitations. Effluent limitations are needed if the 97th percentile of the daily effluent concentration values is greater than the acute wasteload allocation or if the 97th percentile of the four-day average effluent concentration values is greater than the chronic wasteload allocation. In the case of ammonia evaluations, limits are needed if the 97th percentile of the thirty-day average effluent concentration values is greater than the chronic WLA. Effluent limitations are based on the most limiting WLA, the required sampling frequency, and statistical characteristics of the effluent data.

a) Effluent Screening:
Effluent data obtained from the permit application has been reviewed and determined to be suitable for evaluation. Copper and zinc were found to require a wasteload allocation analysis. Manganese was detected during sampling, but human health criterion do not apply to this discharge since it is not into a public water supply. Chloroform and total phenol were found to be present in the discharge at 10.8 µg/L and 61 µg/L. These levels are well below the surface water criteria of 29,000 µg/L and 4,600,000 µg/L for surface waters (see **Attachment 9b**). Therefore, no further evaluation of this data is necessary. The 2006 reissuance file contains a summary of effluent data from the permit application.

b) Determining Wasteload Allocations

Acute Toxicity - DEQ-Guidance Memorandum 2011 states that for surface discharges into tidal estuaries or estuarine embayments, the acute wasteload allocation WLAa should be set at 2 times the acute standard because initial mixing in these circumstances is limited and lethality in the allocated impact zone must be prevented. The 2X factor is derived from the fact that the acute standard or criteria maximum concentration (CMC) is defined as one half of the final acute value (FAV) for a specific toxic pollutant. The term FAV is defined as an estimate of the concentration of the toxicant corresponding to a cumulative probability of 0.05 for the acute toxicity values for all genera for which acceptable acute test have been conducted with the toxicant. Therefore, if the acute value is one half the FAV, then 2 times the acute standard should equal the FAV or equal an acceptable value for preventing lethality.

Chronic Toxicity - DEQ-Guidance Memorandum 2011 states that for surface discharges into tidal estuaries, estuarine embayments, or the open ocean, the WLAc should be based upon site specific data on water dispersion or dilution when available and appropriate. Where wastewater dispersion/dilution data are not available, a dilution ration of 50:1 may be used. While staff acknowledges that some dilution is occurring in the Rappahannock River, it is not appropriate to use the 50:1 dilution ratio. There are three other municipal discharges in the area that greatly influence the mixing zone, and the Massaponax WWTF discharge is close to the fall line. Therefore, large tidal influences may not be realized. Recognizing that 50:1 is too high and no dilution is too stringent (end of pipe) because some mixing is occurring, staff has chosen to use an instream waste concentration of 50% until more evidence becomes available that demonstrates a more appropriate dilution ratio.

Further justification for not using the 50:1 dilution ratio and using the 2X factor to determine chronic wasteload allocations is found by calculating the cumulative Instream Waste Concentration (IWC%) of all four Upper Rappahannock Dischargers (Little Falls Run-13 mgd, Massaponax-8.0 mgd, Fredericksburg-4.5 mgd, and FMC-5.4 mgd) at a 7Q10 flow. The flows from all facilities are critical since they all impact the available mixing zone.

$$IWC = \frac{Qe}{Qe + Qs} = \frac{13\ mgd + 8\ mgd + 4.5\ mgd + 5.4\ mgd}{(13\ mgd + 8\ mgd + 4.5\ mgd + 5.4\ mgd) + 30\ mgd}$$

$$= 0.51\ (51\%)$$

Where: Qe = the combined flows of all four dischargers.
Qs = the 7Q10 of the receiving river at the fall line.

An IWC of 50% would have a similar effect on wasteload allocations as a dilution factor of 2X.

Staff derived wasteload allocations where parameters are reasonably expected to be present in an effluent and where effluent data indicate the pollutant is present in the discharge above quantifiable levels. With regard to the Outfall 001 discharge, monitoring data indicates copper, zinc, manganese, chloroform, and total phenol are present in the discharge. **Attachment 10** details the WLA derivations for copper and zinc.

c) Virginia Institute of Marine Science Rappahannock River Model
Stafford County, Spotsylvania County and the City of Fredericksburg sponsored a water quality model for the

upper Rappahannock River estuary developed by the Virginia Institute for Marine Science, entitled A Modeling Study of the Water Quality of the Upper Rappahannock River (VIMS model). This model was approved by the State Water Control Board Director on December 6, 1991, and has been used to determine effluent limitations for new and expanded discharges in the upper Rappahannock River since then. This model had been run on the following occasions: August 14, 1995, for the issuance of the Haymount permit and the flow expansion at the Fredericksburg STP; August 22, 1996, for the issuance of the Hopyard permit; March 17, 1997, for changes in flow and production at White Packing; April 7, 1999, to accommodate flow expansions at the Little Falls Run WWTP and the Massaponax WWTP; April 2003 for the expansion of the proposed Hopyard WWTP to 0.5 mgd; January 2005, to accommodate an additional flow tier of 13.0 mgd in the Little Falls Run VPDES permit; and August 2006 to model the loadings for the Fredericksburg STP at 4.5 mgd. Due to current regulatory initiatives regarding nutrient loadings to the Chesapeake Bay, the model inputs for nitrogen and phosphorus for the FMC, Massaponax, and Little Falls Run discharges used with this the January 2005 model update are drastically different than former model runs. A summary of the numerous scenarios analyzed and predicted outcomes using the VIMS model is found in **Attachment 11**.

d) Effluent Limitations Toxic Pollutants, Outfall 001

9 VAC 25-31-220.D requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an instream excursion of water quality criteria. Those parameters with WLAs that are near effluent concentrations are evaluated for limits.

The VPDES Permit Regulation at 9 VAC 25-31-230.D requires that monthly and weekly average limitations be imposed for continuous discharges from POTWs and monthly average and daily maximum limitations be imposed for all other continuous non-POTW discharges.

1) Ammonia as N/TKN:
The VIMs model (**Attachment 11**) indicates that the existing total kjeldahl nitrogen (TKN) limit of 9.0 mg/l for the 8.0 mgd design flow is sufficient to protect against chronic toxicity during May through October. The acute ammonia criterion for May through October is 58 mg/l. The acute standard is also met due to the TKN effluent limit of 9.0 mg/l. As in the previous permit reissuance, ammonia limits of 12 mg/l are needed in the winter at an 8.0 mgd design flow.

2) Total Residual Chlorine:
Chlorine is not used for disinfection at this facility. However, it is added continuously to the sandfilters to control algal growth. As stated above in the discussion of WLA derivation, a 2:1 ratio was used to determine the total residual chlorine (TRC) WLAs (see **Attachment 10**). In accordance with current DEQ guidance, staff used a default data point of 0.2 mg/l and the calculated WLAs to derive limits. A monthly average of 0.016 mg/l and a weekly average limit of 0.019 mg/l are proposed for this discharge (see **Attachment 12**).

3) Metals/Organics:
No limits are needed (see **Attachment 12**).

e) Effluent Limitations and Monitoring, Outfall 001 – Conventional and Non-Conventional Pollutants

No changes to dissolved oxygen (DO), biochemical oxygen demand-5 day (BOD_5), total suspended solids (TSS), TKN, and pH limitations are proposed. Dissolved Oxygen, BOD_5, and TKN limitations are based on the August 2006 VIMS Model (**Attachment 11**).

It is staff's practice to equate the Total Suspended Solids limits with the $CBOD_5$ limits. TSS limits are established to equal BOD_5 limits since the two pollutants are closely related in terms of treatment of domestic sewage.

pH limitations are set at the water quality criteria.

E. coli limitations are in accordance with the Water Quality Standards 9 VAC 25-260-170.

f) Effluent Maximum Annual Limitations and Monitoring, Outfall 001 – Nutrients

VPDES Regulation 9 VAC 25-31-220(D) requires effluent limitations that are protective of both the numerical and narrative water quality standards for state waters, including the Chesapeake Bay.

As discussed in Section 15, significant portions of the Chesapeake Bay and its tributaries are listed as impaired with nutrient enrichment cited as one of the primary causes. Virginia has committed to protecting and restoring the Bay and its tributaries.

The State Water Control Board adopted Water Quality Criteria for the Chesapeake Bay in March 2005. In addition to the Water Quality Standards, there are three new regulations that necessitate nutrient limitations:

- 9 VAC 25-40 – *Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed* requires discharges with design flows of ≥0.04 mgd to treat for TN and TP to either BNR levels (TN = 8 mg/l; TP = 1.0 mg/l) or SOA levels (TN = 3.0 mg/l and TP = 0.3 mg/l).

- 9 VAC 25-720 – *Water Quality Management Plan Regulation* sets forth TN and TP maximum wasteload allocations for facilities with design flows of ≥0.5 mgd limiting the mass loading from these discharges.

- 9 VAC 25-820 *General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia* was approved by the State Water Control Board on September 6, 2006 and became effective January 1, 2007. This regulation specifies and controls the nitrogen and phosphorus loadings from facilities and specifies facilities that must register under the general permit. Nutrient loadings for those facilities registered under the general permit as well as compliance schedules and other permit requirements, shall be authorized, monitored, limited, and otherwise regulated under the general permit and not this individual permit. Hence, loading limits for nutrients from the Massaponax WWTP will be governed by the aforementioned general permit.

On April 19, 2001, a Water Quality Improvement Fund Grant Agreement was made between DEQ and Spotsylvania County for the upgrade of the Massaponax WWTF. The grant set a goal of 8.0 mg/l for total nitrogen concentration. At that time, the treatment plant was designed to meet a phosphorus concentration of 2.0 mg/l based on the then current Policy for Nutrient Enriched Waters.

9 VAC 25-40-70, Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed, states that the board shall include technology-based effluent concentration limitations in the individual permit for any facility that has installed technology for the control of nitrogen and phosphorus. 9 VAC 25-40-70 also states that the limitations shall be based upon the technology installed by the facility and shall be expressed as annual average concentrations. The Massaponax facility was designed and constructed to meet an annual average total nitrogen concentration of 8.0 mg/l and a monthly average total phosphorus concentration of 2.0 mg/l.

g) Effluent Limitations and Monitoring Summary.

The effluent limitations are presented in the following table. Limits were established for Flow, Carbonaceous Biochemical Oxygen Demand, Total Suspended Solids, TKN, ammonia, pH, Total Phosphorus, Total Nitrogen, Dissolved Oxygen, Total Residual Chlorine, and *E. coli*. Monitoring was included for Nitrates + Nitrites.

The mass loading (kg/d) for $CBOD_5$ and TSS monthly and weekly averages were calculated by multiplying the concentration values (mg/l), with the flow values in mgd and a conversion factor of 3.785. The mass loading for nutrients are to be calculated by multiplying the concentrations values (mg/l), with the flow values in mgd and a conversion factor of 8.34.

Sample Type and Frequency are in accordance with the recommendations in the VPDES Permit Manual.

18. Antibacksliding:

All limits in this permit are at least as stringent as those previously established. Backsliding does not apply to this reissuance.

19. Effluent Limitations/Monitoring Requirements:

Design flow is 8.0 mgd.
Effective Dates: During the period beginning with the permit's effective date and lasting until the expiration date.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
		Monthly Average	Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow (mgd)	N/A	NL	N/A	N/A	NL	Continuous	TIRE
pH	1	N/A	N/A	6.0 S.U.	9.0 S.U.	1/D	Grab
$CBOD_5$	1, 2	10 mg/l 303 kg/day	15 mg/l 455 kg/day	N/A	N/A	1/D	24H-C
TSS	3	10 mg/l 303 kg/day	15 mg/l 455 kg/day	N/A	N/A	1/D	24H-C
DO	1 ,2	N/A	N/A	6.0 mg/l	N/A	1/D	Grab
TKN (May - Oct)	1, 2	9.0 mg/l 600 lb/day	14 mg/l 934 lb/day	N/A	N/A	1/D	24H-C
TKN (Nov – Apr)	4	NL mg/l	NL mg/l	N/A	N/A	1/W	24H-C
Ammonia, as N (Nov – Apr)	1, 2	12 mg/l	18 mg/l	N/A	N/A	1/W	24H-C
E. coli (Geometric Mean)	1	126 n/100mls	N/A	N/A	N/A	1/D	Grab
Total Residual Chlorine (after dechlorination)	1	0.016 mg/l	0.019 mg/l	N/A	N/A	1/D	Grab
Nitrate+Nitrite, as N	4	NL mg/l NL lb/day	N/A	N/A	N/A	1/W	24H-C
Total Nitrogen [a, b.]	4	NL mg/l NL lb/day	N/A	N/A	N/A	1/W	Calculated
Total Nitrogen – Year to Date [b.]	4	NL mg/l	N/A	N/A	NL	1/M	Calculated
Total Nitrogen - Calendar Year [b.]	4	8.0 mg/l	N/A	N/A	NL	1/Y	Calculated
Total Phosphorus	4	2.0 mg/l 100 lb/day	N/A	N/A	N/A	1/W	24H-C
Chronic Toxicity - *C. dubia* (TU_c)	N/A	N/A	N/A	N/A	NL	1/Y	24H-C
Chronic Toxicity - *P. promelas* (TU_c)	N/A	N/A	N/A	N/A	NL	1/Y	24H-C

The basis for the limitations codes are:

1. Water Quality Standards
2. VIMS Model- **Attachment 11**
3. Best Professional Judgment
4. 9 VAC 25-40 (Nutrient Regulation)
   9 VAC 25-720 (Water Quality Mgmt Plan)

mgd = Million gallons per day.
N/A = Not applicable.
NL = No limit; monitor and report.
TIRE = Totalizing, indicating and recording equipment.
S.U. = Standard units.

1/D = Once every day.
1/W = Once every week.
1/M = Once every month.
1/Y = Once every year.

24H-C = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the monitored 24-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of twenty-four (24) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum of twenty-four (24) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by 10% or more during the monitored discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

a. Total Nitrogen = Sum of TKN plus Nitrate+Nitrite

b. See Section 20.a of the fact sheet for the Nutrient Loading Calculations.

20. Other Permit Requirements :

a) Part I.B. of the permit contains quantification levels and compliance reporting instructions.
9 VAC 25-31-190.L.4.c requires an arithmetic mean for measurement averaging and 9 VAC 25-31-220.D requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an instream excursion of water quality criteria. Specific analytical methodologies for toxics are listed in this permit section as well as quantification levels (QLs) necessary to demonstrate compliance with applicable permit limitations or for use in future evaluations to determine if the pollutant has reasonable potential to cause or contribute to a violation. Required averaging methodologies are also specified.

b) Permit Section Part I.C., details the requirements of a Pretreatment Program.
The VPDES Permit Regulation at 9 VAC 25-31-730. through 900., and the Federal Pretreatment Regulations found in 40 CFR Part 403, requires POTWs with a design flow of >5 mgd and receiving from Industrial Users (IUs) pollutants that pass through or interfere with the operation of the POTW or are otherwise subject to pretreatment standards to develop a pretreatment program.

This treatment works is a POTW with a design capacity of 8.0 mgd. Spotsylvania County also owns and operates the FMC WWTF (4.0 mgd) and the Community of Thornburg STP (0.345 mgd). The combined maximum design capacity for the POTWs owned by the county is 12 mgd. Spotsylvania County has requested a flow increase to 5.4 mgd at the FMC WWTF. This will bring the combined total design capacity for the county to 13 mgd.

The Pretreatment Program for Spotsylvania County was originally approved on October 25, 1996. Spotsylvania County has two Significant Industrial Users (SIUs) regulated through this program (GM Powertrain and Virginia Semiconductor, Inc.). GM Powertrain discharges to the Massaponax WWTF. Virginia Semiconductor, Inc. discharges to the FMC WWTF.

The pretreatment program conditions in the proposed permit reissuance will include: implementation of the approved pretreatment program that complies with the Clean Water Act, the State Water Control Law, state regulations and the approved program.

Attached are the Discharger Survey Short Form and Instructions for the Discharger Survey Form (**Attachment 13**).

c) Permit Section Part I.D., details the requirements for Toxics Management Program.
The VPDES Permit Regulation at 9 VAC 25-31-210 requires monitoring and 9 VAC 25-31-220.I requires limitations in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act. A TMP is imposed for municipal facilities with a design rate >1.0 mgd or an approved pretreatment program or the requirement to develop a pretreatment program. A TMP shall also be imposed for those facilities determined by the Board to need a program based on effluent variability, compliance history, IWC, and receiving stream characteristics.

The Massaponanax WWTP meets two of the above requirements; it is a POTW with a design rate >1.0 mgd, and the facility has an approved pretreatment program. The TMP uses bioassay-testing methods for measuring the potential for the effluent to cause toxicity in the receiving stream.

During the current permit term, the Massaponax WWTP has performed two annual acute and chronic toxicity tests using 24-hour flow-proportioned composite samples of the final effluent and ten quarterly acute and chronic toxicity tests using 24-hour flow-proportioned composite samples of the final effluent after the Certificate to Operate (CTO) was issued for the 8-mgd sewage treatment plant on January 22, 2003. The acute test was a 48-hour static test using *C. dubia* and *P. promelas*. The chronic test was a 3-brood static daily renewal survival and reproduction chronic test performed on *C. dubia and* a 7-day daily renewal larval survival and growth test performed on *P. promelas*. Coastal Bioanalysts, Incorporated in Gloucester, Virginia conducted the tests. A summary of the results to date is found in **Attachment 14.**

The proposed permit includes TMP language that requires the Massaponax WWTF to perform annual chronic toxicity testing for the duration of the permit; there are no requirements for the acute test. Results will be reported annually on the DMR. (**Attachment 15** provides information used to determine the test endpoints).

21. Other Special Conditions :

a) 95% Capacity Reopener. The VPDES Permit Regulation at 9 VAC 25-31-200.B.2 requires all POTWs and PVOTWs develop and submit a plan of action to DEQ when the monthly average influent flow to their sewage treatment plant reaches 95% or more of the design capacity authorized in the permit for each month of any three consecutive month period. This facility is a POTW.

b) Indirect Dischargers. Required by VPDES Permit Regulation, 9 VAC 25-31-280 B.9 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

c) O&M Manual Requirement. Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790; VPDES Permit Regulation, 9 VAC 25-31-190.E. On or before November 30, 2007, the permittee shall submit for approval an Operations and Maintenance (O&M) Manual or a statement confirming the accuracy and completeness of the current O&M Manual to the Department of Environmental Quality, Northern Regional Office (DEQ-NRO). Future changes to the facility must be addressed by the submittal of a revised O&M Manual within 90 days of the changes. Non-compliance with the O&M Manual shall be deemed a violation of the permit.

d) CTC, CTO Requirement. The Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790 requires that all treatment works treating wastewater obtain a Certificate to Construct prior to commencing construction and to obtain a Certificate to Operate prior to commencing operation of the treatment works.

e) Licensed Operator Requirement. The Code of Virginia at §54.1-2300 et seq. and the VPDES Permit Regulation at 9 VAC 25-31-200 D, and Rules and Regulations for Waterworks and Wastewater Works Operators (18 VAC 160-20-10 et seq.) requires licensure of operators. This facility requires a Class I operator.

f) Reliability Class. The Sewage Collection and Treatment Regulation at 9 VAC 25-790 requires sewerage works achieve a certain level of reliability in order to protect water quality and public health consequences in the event of component or system failure. The facility is required to meet a reliability Class of I.

g) Nutrient Reopener. This permit may be modified or alternatively revoked and reissued to include new or alternative nutrient limitations and/or monitoring requirements should the Board adopt nutrient standards for the waterbody receiving the discharge or if a future water quality regulation or statute requires new or alternative nutrient control.

h) Sludge Reopener. The VPDES Permit Regulation at 9 VAC 25-31-200.C.4 requires all permits issued to treatment works treating domestic sewage (including sludge-only facilities) include a reopener clause allowing incorporation of any applicable standard for sewage sludge use or disposal promulgated under Section 405(d) of the CWA. The facility includes a sewage treatment works.

i) Sludge Use and Disposal. The VPDES Permit Regulation at 9 VAC 25-31-100.P., 220.B.2, and 420-720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on their sludge use and disposal practices and to meet specified standards for sludge use and disposal. Technical requirements may be derived from the Virginia Department of Health's Biosolids Use Regulations, 12 VAC 5-585-10 et seq. The facility includes a treatment works treating domestic sewage.

j) TMDL Reopener: This special condition is to allow the permit to reopened if necessary to bring it in compliance with any applicable TMDL that may to developed and approved for the receiving stream. See Fact Sheet Section 26 for further discussion.

k) Mixing Zone Study. This special condition allows the permittee to conduct a site specific mixing zone study for the receiving waters to determine wasteload allocations for toxic pollutants. The permittee may request that the permit be modified to reflect the results. Protocols for such a study must be approved by DEQ prior to initiation of the study and must account for all major dischargers in closer proximity to the Massaponax WWTF.

l) Environmental Excellence Program. The annual average concentration limitations for Total Nitrogen and/or Total Phosphorus are suspended during any calendar year in which the facility is considered by DEQ to be a participant in the Virginia Environmental Excellence Program in good standing at either the Exemplary Environmental Enterprise (E3) level or the Extraordinary Environmental Enterprise (E4) level.

m) Nutrient Reopener. 9 VAC 25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade. 9 VAC 25-31-390 A authorizes DEQ to modify VPDES permits to promulgate amended water quality standards.

22. Permit Section Part II. Part II of the permit contains standard conditions that appear in all VPDES Permits. In general, these standard conditions address the responsibilities of the permittee, reporting requirements, testing procedures and records retention.

23. Changes to the Permit from the Previously Issued Permit:

a) Special Conditions:
1) The Pretreatment language (Permit Part I.C) and the Toxics Management Program language (Permit Part I.D) were updated to reflect current agency guidance.
2) The Environmental Excellence Program Special Condition has been added.
3) A TMDL Reopener Special Condition has been added.
4) The Water Quality Criteria Special Condition has been removed.
5) The Nutrient Enriched Waters Reopener has been removed.
6) Special Conditions for E3/E4 and a Nutrient Reopener were added.

b) Monitoring and Effluent Limitations:
1) Only the 8.0 design flow tier is present. All limits associated with the 6.0 mgd design flow tier are hence removed from the permit.
2) Monitoring and effluent limitations were added for nitrogen (total nitrogen, total nitrogen – year to date, total nitrogen – calendar year) and phosphorus (total phosphorus, total phosphorus – year to date, total phosphorus – calendar year).
3) Monitoring for Nitrate + Nitrite was placed in the permit to replace the individual monitoring for nitrate and nitrite.
4) The Fecal Coliform limitation was replaced with an *E. coli* limitation due to an update to the Water Quality Standards.
5) Limits associated with the RADCO Plan have been removed, since the RADCO plan was repealed on April 24, 2003.

24. Variances/Alternate Limits or Conditions: None

25. Public Notice Information:

First Public Notice Date: July 20, 2007 Second Public Notice Date: July 27, 2007

Public Notice Information is required by 9 VAC 25-31-280 B. All pertinent information is on file and may be inspected, and copied by contacting the: Northern DEQ Regional Office, 13901 Crown Court, Woodbridge, VA 22193, Telephone No. (703) 583-3837, atwesternik@deq.virginia.gov. See **Attachment 16** for a copy of the public notice document.

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing if public response is significant. Requests for public hearings shall state the reason why a hearing is requested, the nature of the issues proposed to be raised in the public hearing and a brief explanation of how the requester's interests would be directly and adversely affected by the proposed permit action. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given.

26. 303 (d) Listed Stream Segments and Total Max. Daily Loads (TMDL):

This facility discharges directly to the Rappahannock River. The stream segment downstream of the segment receiving the effluent is noted with three impairments in the 2006 Integrated Report: bacteria (fecal coliform and *E. coli*), PCBs in fish tissue, and aquatic plants (macrophytes) due to insufficient acreage of submerged aquatic vegetation (SAV). A TMDL has not been prepared or approved for the watershed. This permit has a limit of 126 n/cmL for *E. coli* that requires compliance with the criterion prior to discharge. With this limit in effect, it is unlikely that the facility will contribute to the impairment. The permit contains a reopener condition that may allow these limits to be modified in compliance with section 303(d)(4) of the Act once a TMDL is approved.

In January 2003, the bacteria water quality criterion for permitted discharges was changed from Fecal Coliform to *E. coli* for freshwater and enterococci for transition and salt waters. Since *E. coli* is a subspecies of the Fecal Coliform group, it is staff's best professional opinion that the *E. coli* limit will be protective of the Water Quality Standards.

27. Additional Comments:

Previous Board Actions: A Special Order was issued to this facility by the State Water Control Board on February 19, 1998 and amended on January 24, 1999, July 8, 1999, and March 30, 2000. This facility has been upgraded and discharges of raw or partially treated sewage have been eliminated. The order was closed on March 23, 2003.

Staff Comments: None

Public Comment: No comments were received during the public notice period.

EPA Checklist: The checklist can be found in **Attachment 17**.

ATTACHMENTS

Attachment 1 -	Flow Frequency Determination for the Rappahannock River near Fredericksburg
Attachment 2	Schematic of the Wastewater Treatment Plant Zones
Attachment 3 -	Facility Flow Diagram
Attachment 4 -	Topographic Map
Attachment 5 -	Solids Handing Schematic
Attachment 6 -	Massaponax WWTF Chemical Inventory
Attachment 7 -	Site Inspection Summary from August 2006
Attachment 8 -	Fact Sheets from the 2006 303(d)/305(b) Integrated Report
Attachment 9a -	Dissolved Oxygen Water Quality Criteria
Attachment 9b-	Water Quality Standards dated January 2006
Attachment 10 -	Freshwater Water Quality Criteria and Wasteload Allocations
Attachment 11 -	VIMS Summary
Attachment 12 -	Limitations Calculations
Attachment 13	Discharger Survey Short Form and Instructions for the Discharger Survey Form
Attachment 14 -	Toxics Monitoring Summary
Attachment 15 -	Toxics Monitoring Test Endpoints
Attachment 16 -	Public Notice
Attachment 17-	EPA Checklist

Flow Frequencies at the Massaponax WWTF Discharge Point (VA0025658)

Rappahannock River Near Fredericksburg, VA (Gaging Station #01666800)					
30Q10 Low Temp (MGD)	318.7			30Q10 Low Flow (MGD)	50.3
7Q10 Low Temp (MGD)	231.6			7Q10 Low Flow (MGD)	29.7
1Q10 Low Temp (MGD)	195.5			1Q10 Low Flow (MGD)	24.5
30Q5 (MGD)	80.0			Harmonic Mean	298.7
Rappahannock River at the Massaponax WWTF Discharge Point (Outfall 001)					
30Q10 Low Temp (MGD)	326.5			30Q10 Low Flow (MGD)	51.6
7Q10 Low Temp (MGD)	237.3			7Q10 Low Flow (MGD)	30.4
1Q10 Low Temp (MGD)	200.3			1Q10 Low Flow (MGD)	25.1
30Q5 (MGD)	82.0			Harmonic Mean	306.0

Flow frequencies were calculated using data collected at Gaging Station #0166800 during the period of 1907 to 2003.

The values at the discharge point were calculated using drainage area proportions and do not address withdrawals, discharges, or springs lying between the gage and the discharge point.

The following formula was used to determine the flow at the discharge point:

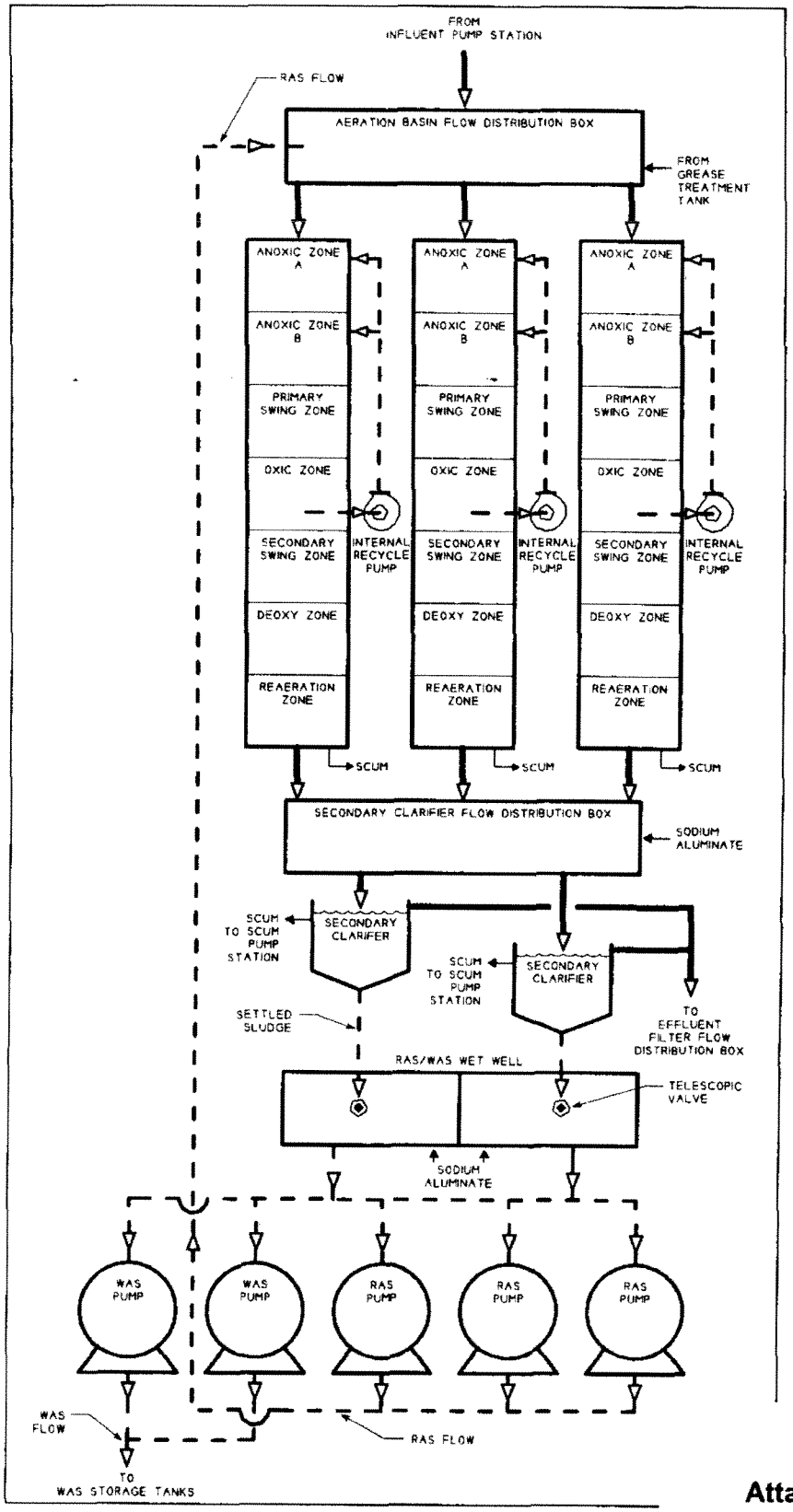
$$\frac{\text{(Drainage Area at Discharge Point) Flow at Gaging Station}}{\text{Drainage Area at Gaging Station}}$$

Drainage Area at Discharge Point is 1635 square miles
Drainage Area at Gaging Station is 1596 square miles

The low temperature months are Nov-Apr.

Attachment 1

FIGURE 1 - PROCESS FLOW SCHEMATIC



Attachment 2

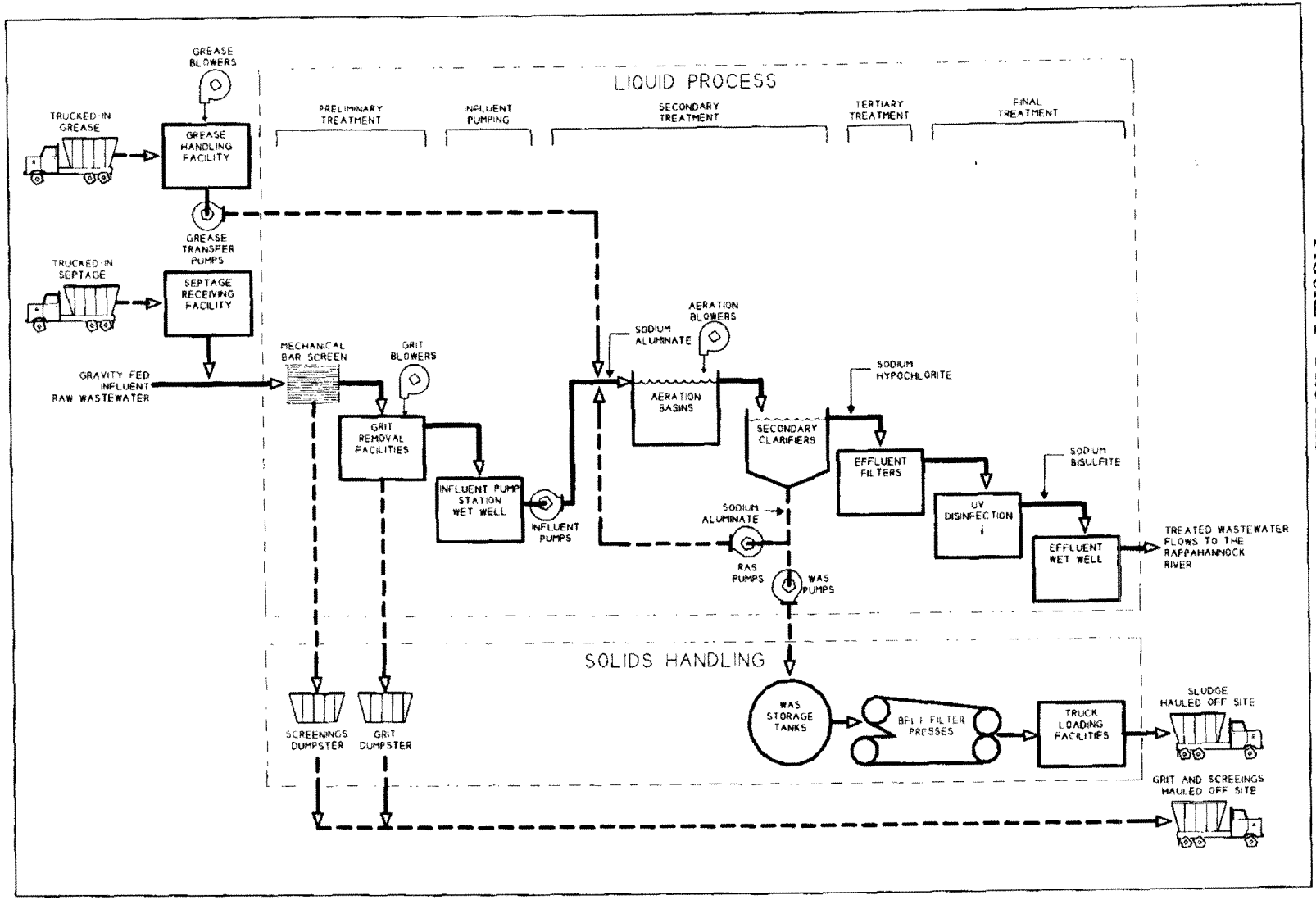
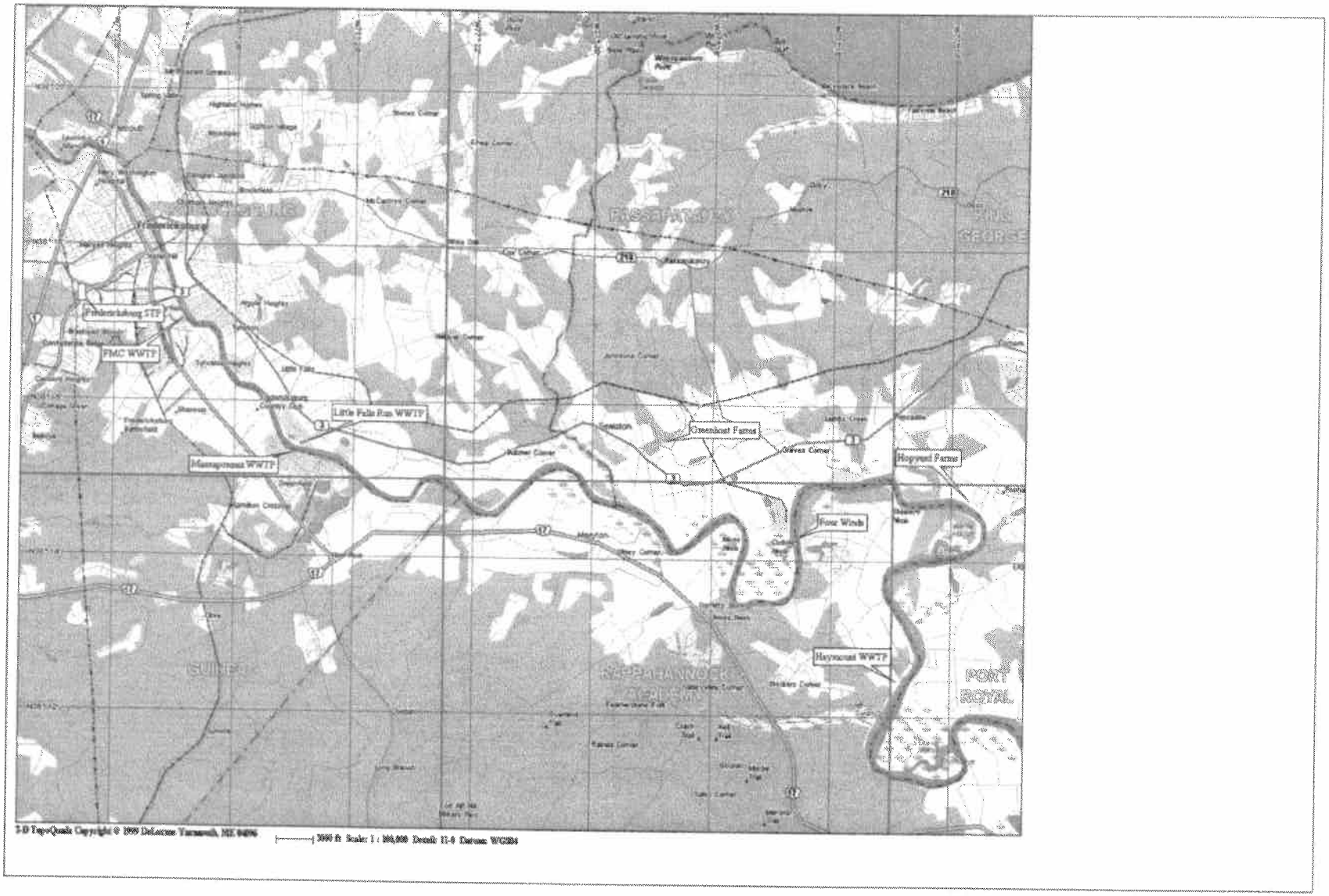


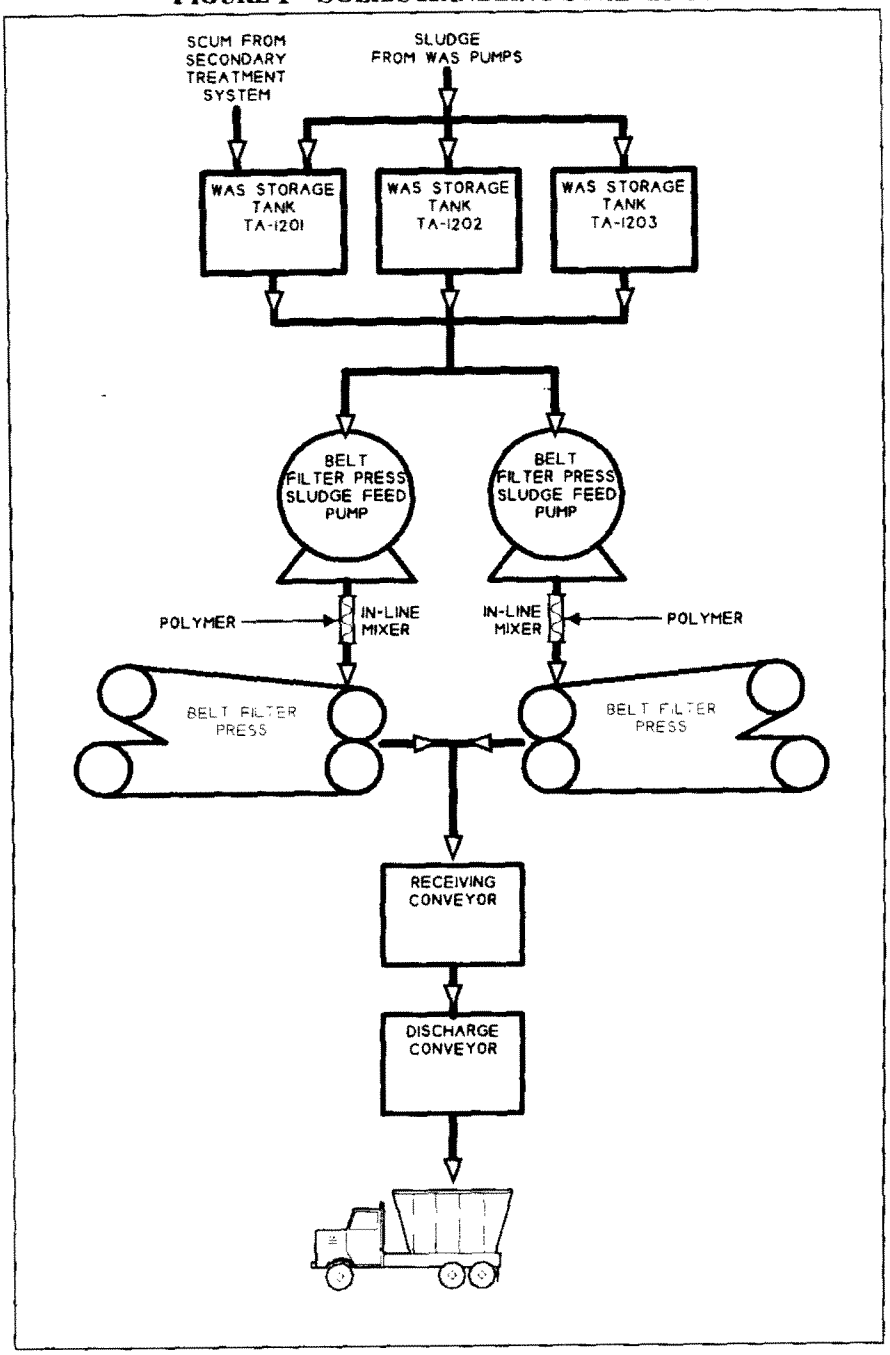
FIGURE 1 - PROCESS FLOW SCHEMATIC

Attachment 3



Attachment 4

FIGURE 1 - SOLIDS HANDLING SCHEMATIC



Attachment 5

SPOTSYLVANIA COUNTY UTILITIES CHEMICAL INVENTORY

MASSAPONAX WWTF

CHEMICAL		CAPACITY
50% CAUSTIC		8,000 GAL.
SODA ASH		40,000 LBS.
POLYMER		1,000 GAL.
SODIUM HYPOCHLORITE		9,000 GAL.
SODIUM BISULFITE		4,500 GAL.
DEFOAMER		1,200 GAL.

Attachment 6

	Problems identified at last inspection (**September 14, 2005**):	Corrected	Not Corrected
1.	Secondary clarifiers appeared to have flow imbalance.	[**X**]	[ ]
2.	Secondary clarifier scum arms had appreciable algal growth.	[**X**]	[ ]
3.	Sludge scraper on belt filter press needed adjustment.	[**X**]	[ ]
4.	Possible dead spots at junction of aeration basin aerobic/anoxic zones.	[**X**]	[ ]

Summary for Current Inspection

Comments:

- **The plant is well maintained and run.**
- **The manual bar screen had some rags and paper stuck on it.**
- **A septage truck had just finished unloading prior to the inspection. The septage receiving facility was not properly cleaned prior to the truck departing.**
- **One containment berm had debris and standing stormwater; it was the berm for the Sodium Aluminate fill pipe.**
- **In the belt press building, some sludge was noticed on the floor near feed pump #2.**
- **The final discharge flume has a liner and the edges appeared to be loose, which could allow water to undercut the channel.**
- **In the secondary clarifiers, the overflow near the stairs cascades off the wall while the overflow hugs the wall several feet further to the right of this point. This suggests the weir levels are not even.**

Recommendations for action:

- **Please maintain manual bar screen in a clean and ready state.**
- **Please remind septage trucks to properly rinse the septage receiving area prior to departure.**
- **Please check all containment berms and ensure water is properly drained.**
- **Please have dried sludge near the filter press feed pumps removed from the floor.**
- **Please check the liner for the final discharge channel and repair as needed.**
- **DEQ would appreciate Spotsylvania County verifying that the secondary clarifier weirs are level.**

*Appendix A - List of Impaired (Category 5) Waters in 2006**

Assessment Unit ID	Waterbody Name	City / County	Assessment Unit Description

Rappahannock River Basin

TMDL Watershed Name: **Rappahannock River, Tidal Fresh**

TMDL Group ID: **00322**

VAN-E20E_RPP03A02 **Rappahannock River** — FREDERICKSBURG CITY, STAFFORD CO

Segment begins at the fall line at Route One and continues downstream until the confluence with Deep Run.
Portion of CBP segment RPPTF.

VA Overall AU Category: **5A**

Use	Impairment	0.21 SQUARE MILES	TMDL Group ID	First Listed on 303(d)	TMDL Schedule	Impairment Specific Comments and/or Impairment Specific VA Category
Recreation	**Escherichia coli**		00322	**2006**	**2010**	Sufficient exceedances of the instantaneous E.coli bacteria criterion (5 of 11 samples - 45.4%) were recorded at DEQ's ambient water quality monitoring station (3-RPP1110.57) at the Route One bridge to assess this stream segment as not supporting of the recreation use goal for the 2006 water quality assessment.
		Sources: Source Unknown				
Recreation	**Fecal Coliform**		00322	**2002**	**2010**	Sufficient exceedances of the instantaneous fecal coliform bacteria criterion (3 of 16 samples - 18.8% and 6 of 13 samples - 46.2%, respectively) were recorded at DEQ's ambient water quality monitoring station (3-RPP107.91) one hundred yards below the Fredericksburg Wastewater Treatment Facility and DEQ's ambient water quality monitoring station (8-RPP110.57) at the Route One bridge to assess this stream segment as not supporting of the recreation use goal for the 2006 water quality assessment.
		Sources: Source Unknown				

VAN-E21E_RPP03A02 **Rappahannock River** — CAROLINE CO, KING GEORGE CO

Segment begins at the confluence with Mount Creek and continues downstream until the confluence with Mill Creek.
Portion of CBP segment RPPTF.

VA Overall AU Category: **5A**

Use	Impairment	1.36 SQUARE MILES	TMDL Group ID	First Listed on 303(d)	TMDL Schedule	Impairment Specific Comments and/or Impairment Specific VA Category
Recreation	**Escherichia coli**		00322	**2006**	**2010**	Sufficient exceedances of the instantaneous E.coli bacteria criterion (2 of 14 samples - 14.3%) were recorded at DEQ's ambient water quality monitoring station (3-RPP080.19) at the Route 301 bridge to assess this stream segment as not supporting of the recreation use goal for the 2006 water quality assessment. The segment was previously listed for a fecal coliform bacteria impairment, beginning in 2002.
		Sources: Source Unknown				

VAN-E21E_RPP04A02 **Rappahannock River** — CAROLINE CO, KING GEORGE CO

Segment begins at the confluence with Ware Creek and continues downstream until the confluence with Mount Creek.
Portion of CBP segment RPPTF.

VA Overall AU Category: **5A**

Use	Impairment	1.20 SQUARE MILES	TMDL Group ID	First Listed on 303(d)	TMDL Schedule	Impairment Specific Comments and/or Impairment Specific VA Category
Recreation	**Escherichia coli**		00322	**2006**	**2010**	Sufficient exceedances of the instantaneous E.coli bacteria criterion (3 of 13 samples - 23.1%) were recorded at DEQ's ambient water quality and Chesapeake Bay monitoring station (3-RPP091.55) at buoy 89 to assess this stream segment as not supporting of the recreation use goal for the 2006 water quality assessment. The segment was previously listed for a fecal coliform bacteria impairment, beginning in 2002.
		Sources: Source Unknown				

*Appendix A - List of Impaired (Category 5) Waters in 2006**

Assessment Unit ID	Waterbody Name	City / County	Assessment Unit Description

Rappahannock River Basin

TMDL Watershed Name: **Bay Segment RPPTF**

TMDL Group ID: **60127**

VAN-E20E_RPP01A02 **Rappahannock River** SPOTSYLVANIA CO, STAFFORD CO

Segment begins at the confluence with Massaponax Creek and continues downstream until the outlet of waterbody VAN-E20E. This segment represents the upper reach of VAN-E21E_RPP05A02. Portion of CBP segment RPPTF.

VA Overall AU Category: **5A**

Use	Impairment	0.19 SQUARE MILES	TMDL Group ID	First Listed on 303(d)	TMDL Schedule	Impairment Specific Comments and/or Impairment Specific VA Category
Aquatic Life	**Aquatic Plants (Macrophytes)**		60127	**2006**	**2010**	

Sources:
- Agriculture
- Atmospheric Deposition - Nitrogen
- Clean Sediments
- Industrial Point Source Discharge
- Internal Nutrient Recycling
- Loss of Riparian Habitat
- Municipal Point Source Discharges
- Sediment Resuspension (Clean Sediment)
- Sources Outside State Jurisdiction or Borders
- Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)

Shallow-Water Submerged Aquatic Vegetation	**Aquatic Plants (Macrophytes)**	60127	**2006**	**2010**	

Sources:
- Agriculture
- Atmospheric Deposition - Nitrogen
- Clean Sediments
- Industrial Point Source Discharge
- Internal Nutrient Recycling
- Loss of Riparian Habitat
- Municipal Point Source Discharges
- Sediment Resuspension (Clean Sediment)
- Sources Outside State Jurisdiction or Borders
- Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)

*Appendix A - List of Impaired (Category 5) Waters in 2006**

Assessment Unit ID	Waterbody Name	City / County	Assessment Unit Description

Rappahannock River Basin

TMDL Watershed Name: **Rappahannock River, Tidal Fresh**

TMDL Group ID: **60138**

VAN-E20E_RPP03A02 **Rappahannock River** — FREDERICKSBURG CITY, STAFFORD CO

Segment begins at the fall line at Route One and continues downstream until the confluence with Deep Run.
Portion of CBP segment RPPTF.

VA Overall AU Category: **5A**

Use	Impairment		TMDL Group ID	First Listed on 303(d)	TMDL Schedule	Impairment Specific Comments and/or Impairment Specific VA Category
Fish Consumption	**PCB in Fish Tissue**	0.21 SQUARE MILES	60138	**2004**	**2016**	The fish consumption use is categorized as impaired due to a Virginia Department of Health, Division of Health Hazards Control, PCB fish consumption advisory. The advisory, dated 12/13/04, limits American eel, blue catfish, carp, channel catfish, croaker, gizzard shad, and anadromous (coastal) striped bass consumption to no more than two meals per month. The affected area extends from the I-95 bridge above Fredericksburg downstream to the mouth of the river near Stingray Point, including its tributaries Hazel Run up to the I-95 bridge crossing and Claiborne Run up to the Route One bridge crossing. Exceedances of the water quality criterion based tissue value (TV) of 54 parts per billion (ppb) for polychlorinated biphenyls (PCBs) in fish tissue were recorded in three species of fish samples collected in 2001 at monitoring station 3-RPP107.33 (gizzard shad, channel catfish, and carp). As a result, the waters were assessed not supporting of the CWA's fish consumption use goal.

Sources: Source Unknown

VAN-E20R_CLB01A00 **Claiborne Run** — STAFFORD CO

Segment begins at the confluence with an unnamed tributary to Claiborne Run, approximately 0.5 rivermile upstream of the Route 1 crossing, and continues downstream until the confluence with the Rappahannock River.

VA Overall AU Category: **5A**

Use	Impairment		TMDL Group ID	First Listed on 303(d)	TMDL Schedule	Impairment Specific Comments and/or Impairment Specific VA Category
Fish Consumption	**PCB in Fish Tissue**	4.89 MILES	60138	**2006**	**2018**	The fish consumption use is categorized as impaired due to a Virginia Department of Health, Division of Health Hazards Control, PCB fish consumption advisory. The advisory, dated 12/13/04, limits American eel, blue catfish, carp, channel catfish, croaker, gizzard shad, and anadromous (coastal) striped bass consumption to no more than two meals per month. The affected stretch extends from the Route 1 bridge crossing until the confluence with the Rappahannock River.

Sources: Source Unknown

VAN-E20R_HAL01A00 **Hazel Run** — FREDERICKSBURG CITY, SPOTSYLVANIA CO

Segment begins at the Route 95 crossing and continues downstream until the confluence with the Rappahannock River.

VA Overall AU Category: **5A**

Use	Impairment		TMDL Group ID	First Listed on 303(d)	TMDL Schedule	Impairment Specific Comments and/or Impairment Specific VA Category
Fish Consumption	**PCB in Fish Tissue**	4.46 MILES	60138	**2006**	**2018**	The fish consumption use is categorized as impaired due to a Virginia Department of Health, Division of Health Hazards Control, PCB fish consumption advisory. The advisory, dated 12/13/04, limits American eel, blue catfish, carp, channel catfish, croaker, gizzard shad, and anadromous (coastal) striped bass consumption to no more than two meals per month. The affected stretch extends from the Route 95 bridge crossing until the confluence with the Rappahannock River.

Sources: Source Unknown

Dissolved Oxygen Criteria (9 VAC 25-260-185)

Designated Use	Criteria Concentration/Duration	Temporal Application
Migratory fish spawning and nursery	7-day mean > 6 mg/L (tidal habitats with 0-0.5 ppt salinity)	February 1 – May 31
	Instantaneous minimum > 5 mg/L	
Open-water[1,2]	30-day mean > 5.5 mg/L (tidal habitats with 0-0.5 ppt salinity) 30-day mean > 5 mg/L (tidal habitats with >0.5 ppt salinity)	Year-round
	7-day mean > 4 mg/L	
	Instantaneous minimum > 3.2 mg/L at temperatures < 29°C Instantaneous minimum > 4.3 mg/L at temperatures > 29°C	
Deep-water	30-day mean >3 mg/L	June 1-September 30
	1-day mean > 2.3 mg/L	
	Instantaneous minimum > 1.7 mg/L	
Deep-channel	Instantaneous minimum > 1 mg/L	June 1-September 30

[1]See subsection aa of 9 VAC 25-260-310 for site specific seasonal open-water dissolved oxygen criteria applicable to the tidal Mattaponi and Pamunkey Rivers and their tidal tributaries.

[2]In applying this open-water instantaneous criterion to the Chesapeake Bay and its tidal tributaries where the existing water quality for dissolved oxygen exceeds an instantaneous minimum of 3.2 mg/L, that higher water quality for dissolved oxygen shall be provided antidegradation protection in accordance with section 30 subsection A.2 of the Water Quality Standards.

Attachment 9a

Table of Parameters [6]

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
Acenapthene(µg/l) 83329					1,200	2,700
Acrolein (µg/l) 107028					320	780
Acrylonitrile (µg/l) 107131 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.59	6.6
Aldrin (µg/l) 309002 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.	3.0		1.3		0.0013	0.0014
Ammonia (µg/l) 766-41-7 Chronic criterion is a 30-day average concentration not to be exceeded more than once every three 3 years on the average. (see 9 VAC 25-260-155)						
Anthracene (µg/l) 120127					9,600	110,000
Antimony (µg/l) 7440360					14	4,300
Arsenic (µg/l [5]) 7440382	340	150	69	36	10	
Bacteria (see 9 VAC 25-260-160 and 170)						
Barium (µg/l) 7440393					2,000	
Benzene µg/l 71432 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					12	710
Benzidine (µg/l) 92875 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					0.0012	0.0054
Benzo (a) anthracene (µg/l) 56553 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					0.044	0.49

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
Benzo (b) fluoranthene (µg/l) 205992 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					0.044	0.49
Benzo (k) fluoranthene (µg/l) 207089 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					0.044	0.49
Benzo (a) pyrene (µg/l) 50328 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					0.044	0.49
Bis2-Chloroethyl Ether 111444 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					0.31	14
Bis2-Chloroisopropyl Ether (µg/l) 39638329					1,400	170,000
Bromoform (µg/l) 75252 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					44	3,600
Butyl benzyl phthalate (µg/l) 85687					3,000	5,200

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
Cadmium (µg/l[5]) 7440439 Freshwater values are a function of total hardness as calcium carbonate $CaCO_3$ mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. **Freshwater acute criterion (µg/l)** $WER\left[e^{\{1.128[\ln(hardness)]-3.828\}}\right]$ **Freshwater chronic criterion (µg/l)** $WER\left[e^{\{0.7852[\ln(hardness)]-3.490\}}\right]$ WER = Water Effect Ratio =1 unless shown otherwise under 9 VAC 25-260-140.F and listed in 9 VAC 25-260-310 e = natural antilogarithm ln = natural logarithm	3.9 WER = 1 $CaCO_3$=100	1.1 WER = 1 $CaCO_3$ = 100	40 WER=1	8.8 WER=1	5	
Carbon tetrachloride (µg/l) 56235 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					2.5	44
Chlordane (µg/l) 57749 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.	2.4	0.0043	0.09	0.0040	0.021	0.022
Chloride (µg/l) 16887006 Human Health criterion to maintain acceptable taste and aesthetic quality and applies at the drinking water intake.	860,000	230,000			250,000	
Chlorine, Total Residual (µg/l) 7782505 In DGIF class i and ii trout waters (9 VAC 25-260 subsections 390-540) or waters with threatened or endangered species are subject to the halogen ban (subsection 110.)	19 See 9 VAC 25-260-110	11 See 9 VAC 25-260-110				
Chlorine Produced Oxidant (µg/l) 7782505			13	7.5		
Chlorobenzene (µg/l) 108907					680	21,000

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
Chlorodibromomethane (µg/l) 124481 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					4.1	340
Chloroform (µg/l) 67663 Known or suspected carcinogen; however, non-carcinogen calculation used and is protective of carcinogenic effects. Use 30Q5 as default design flow (see footnote 6.)					350	29,000
2-Chloronaphthalene (µg/l) 91587					1,700	4,300
2-Chlorophenol (µg/l) 95578					120	400
Chlorpyrifos (µg/l) 2921882	0.083	0.041	0.011	0.0056		
Chromium III (µg/l[50] 16065831 Freshwater values are a function of total hardness as calcium carbonate $CaCO_3$ mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. **Freshwater acute criterion µg/l** $WER\left[e^{\{0.8190[\ln(\text{hardness})]+3.7256\}}\right](CF_a)$ **Freshwater chronic criterion µg/l** $WER\left[e^{\{0.8190[\ln(\text{hardness})]+0.6848\}}\right](CF_c)$ WER = Water Effect Ratio = 1 unless shown otherwise under 9 VAC 25-260-140.F and listed in 9 VAC 25-260-310 e = natural antilogarithm ln=natural logarithm CF_a=0316 CF_c=0.860	570 (WER=1; $CaCO_3$=100)	74 (WER=1; $CaCO_3$=100)			100 (total Cr)	
Chromium VI (µg/l[5]) 18540299	16	11	1,100	50		

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
Chrysene (µg/l) 218019 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.044	0.49
Copper (µg/l[5]) 7440508 Freshwater values are a function of total hardness as calcium carbonate $CaCO_3$ mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. **Freshwater acute criterion (µg/l)** $WER\left[e^{\{0.9422[\ln(hardness)]-1.700\}}\right](CF_a)$ **Freshwater chronic criterion µg/l** $WER\left[e^{\{0.8545[\ln(hardness)]-1.702\}}\right](CF_c)$ WER = Water Effect Ratio =1 unless shown otherwise under 9 VAC 25-260-140.F and listed in 9 VAC 25-260-310. e = natural antilogarithm ln=natural logarithm $CF_a = 0.960$ $CF_c = 0.960$ Acute saltwater criterion is a 24-hour average not to be exceeded more than once every three years on the average.	13 WER=1 $CaCO_3$=100	9.0 WER=1 $CaCO_3$=100	9.3 WER=1	6.0 WER=1	1,300	
Cyanide (µg/l) 57125	22	5.2	1.0	1.0	700	220,000
DDD (µg/l) 72548 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.0083	0.0084
DDE (µg/l) 72559 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.0059	0.0059
DDT (µg/l) 50293 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.	1.1	0.0010	0.13	0.0010	0.0059	0.0059

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
Demeton (µg/l) 8065483		0.1		0.1		
Dibenz (a,h) anthracene (µg/l) 53703 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.044	0.49
Dibutyl phthalate µg/l 84742					2,700	12,000
Dichloromethane (µg/l) 75092 Known or suspected carcinogen; human health criteria at risk level 10^{-5} Synonym = Methylene Chloride					47	16,000
1,2–Dichlorobenzene (µg/10) 95501					2,700	17,000
1,3– Dichlorobenzene (µg/l) 541731					400	2,600
1,4 Dichlorobenzene (µg/l) 106467					400	2,600
3,3 Dichlorobenzidine 91941 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.4	0.77
Dichlorobromomethane (µg/l) 75274 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					5.6	460
1,2 Dichloroethane (µg/l) 107062 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					3.8	990
1,1 Dichloroethylene (µg/l) 75354					310	17,000
1,2-trans-dichloroethylene (µg/l) 156605					700	140,000

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
2,4 Dichlorophenol (µg/l) 120832					93	790
2,4 Dichlorophenoxy acetic acid (2,4-D) (µg/l) 94757					100	
1,2-Dichloropropane (µg/l) 78875 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					5.2	390
1,3-Dichloropropene (µg/l) 542756					10	1,700
Dieldrin (µg/l) 60571 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.	0.24	0.056	0.71	0.0019	0.0014	0.0014
Diethyl Phthalate (µg/l) 84662					23,000	120,000
Di-2-Ethylhexyl Phthalate (µg/l) 117817 Known or suspected carcinogen; human health criteria at risk level 10^{-5}. Synonym = Bis2-Ethylhexyl Phthalate.					18	59
2,4 Dimethylphenol (µg/l) 105679					540	2,300
Dimethyl Phthalate (µg/l) 131113					313,000	2,900,000
Di-n-Butyl Phthalate (µg/l) 84742					2,700	12,000
2,4 Dinitrophenol (µg/l) 51285					70	14,000
2-Methyl-4,6-Dinitrophenol (µg/l) 534521					13.4	765

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
2,4 Dinitrotoluene (µg/l) 121142 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					1.1	91
Dioxin 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin (ppq) 1746016 Criteria are based on a risk level of 10^{-5} and potency of 1.75 x 10^{4} mg/kg–day^{-1} To calculate an average effluent permit limit, use mean annual stream flow.					1.2	1.2
1,2-Diphenylhydrazine (µg/l) 122667 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					0.40	5.4
Dissolved Oxygen (mg/l) (See 9 VAC 25-260-50 and 9 VAC 25-260-55)						
Alpha-Endosulfan (µg/l) 959988	0.22	0.056	0.034	0.0087	110	240
Beta-Endosulfan (µg/l) 33213659	0.22	0.056	0.034	0.0087	110	240
Endosulfan Sulfate (µg/l) 1031078					110	240
Endrin (µg/l) 72208	0.086	0.036	0.037	0.0023	0.76	0.81
Endrin Aldehyde (µg/l) 7421934					0.76	0.81
Ethylbenzene (µg/l) 100414					3,100	29,000
Fecal Coliform (see 9 VAC 25-260-160 and 9 VAC 25-260-170)						
Fluoranthene (µg/l) 206440					300	370

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
Fluorene (µg/l) 86737					1,300	14,000
Foaming Agents (µg/l) Criterion measured as methylene blue active substances. Criterion to maintain acceptable taste, odor, or aesthetic quality of drinking water and applies at the drinking water intake.					500	
Guthion (µg/l) 86500		0.01		0.01		
Heptachlor (µg/l) 76448 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.	0.52	0.0038	0.053	0.0036	0.0021	0.0021
Heptachlor Epoxide (µg/l) 1024573 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.	0.52	0.0038	0.053	0.0036	0.0010	0.0011
Hexachlorobenzene (µg/l) 118741 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.0075	0.0077
Hexachlorobutadiene (µg/l) 87683 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					4.4	500
Hexachlorocyclohexane Alpha-BHC (µg/l) 319846 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.039	0.13
Hexachlorocyclohexane Beta-BHC (µg/l) 319857 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.14	0.46
Hexachlorocyclohexane (µg/l) (Lindane) Gamma-BHC 58899 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.	0.95		0.16		0.19	0.63
Hexachlorocyclopentadiene (µg/l) 77474					240	17,000

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
Hexachloroethane (µg/l) 67721 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					19	89
Hydrogen sulfide (µg/l) 7783064		2.0		2.0		
Indeno (1,2,3,-cd) pyrene (µg/l) 193395 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.044	0.49
Iron (µg/l) 7439896 Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.					300	
Isophorone (µg/l) 78591 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					360	26,000
Kepone (µg/l) 143500		zero		zero		
Lead (µg/l)[5] 7439921 Freshwater values are a function of total hardness as calcium carbonate $CaCO_3$ mg/l and the water effect ratio. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. **Freshwater acute criterion (µg/l)** $WER[e^{\{1.273[\ln(hardness)]-1.084\}}]$ **Freshwater chronic criterion (µg/l)** $WER[e^{\{1.273[\ln(hardness)]-3.259\}}]$ WER = Water Effect Ratio =1 unless shown otherwise under 9 VAC 25-260-140.F and listed in 9 VAC 25-260-310 e = natural antilogarithm ln = natural logarithm	120 WER = 1 $CaCO_3$ = 100	14 WER = 1 $CaCO_3$ = 100	240 WER=1	9.3 WER=1	15	
Malathion (µg/l) 121755		0.1		0.1		

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
Manganese (µg/l) 7439965 Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.					50	
Mercury µg/l[5] 7439976	1.4	0.77	1.8	0.94	0.050	0.051
Methyl Bromide (µg/l) 74839					48	4,000
Methoxychlor (µg/l) 72435		0.03		0.03	100	
Mirex (µg/l) 2385855		zero		zero		
Monochlorobenzene (µg/l) 108907					680	21,000
Nickel (µg/L[9] 744002 Freshwater values are a function of total hardness as calcium carbonate $CaCO_3$ mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. **Freshwater acute criterion µg/l** $WER[e^{\{0.8460[\ln(hardness)]+1.312\}}](CF_a)$ **Freshwater chronic criterion (µg/l)** $WER[e^{\{0.8460[\ln(hardness)]-0.8840\}}](CF_c)$ WER =Water Effect Ratio = unless shown otherwise under 9 VAC 25-260-140.F and listed in 9 VAC 25-250-310 e = natural antilogarithm ln = natural logarithm (CF_a)=0.998 (CF_c)=0.997	180 WER =1 $CaCO_3$ = 100	20 WER = 1 $CaCO_3$ = 100	74 WER=1	8.2 WER=1	610	4,600
Nitrate as N (µg/l) 14797558					10,000	

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
Nitrobenzene (µg/l) 98953					17	1,900
N-Nitrosodimethylamine (µg/l) 62759 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.0069	81
N-Nitrosodiphenylamine (µg/l) 86306 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					50	160
N-Nitrosodi-n-propylamine (µg/l) 621647 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.05	14
Parathion (µg/l) 56382	0.065	0.013				
PCB 1260 (µg/l) 11096825		0.014		0.030		
PCB 1254 (µg/l) 11097691		0.014		0.030		
PCB 1248 (µg/l) 12672296		0.014		0.030		
PCB 1242 (µg/l) 53469219		0.014		0.030		
PCB 1232 (µg/l) 11141165		0.014		0.030		
PCB1221 (µg/l) 11104282		0.014		0.030		
PCB 1016 (µg/l) 12674112		0.014		0.030		

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
PCB Total (µg/l) 1336363 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					0.0017	0.0017
Pentachlorophenol (µg/l) 87865 Known or suspected carcinogen; human health criteria risk level at 10^{-5} **Freshwater acute criterion (µg/l)** $e^{(1.005(pH)-4.869)}$ **Freshwater chronic criterion (µg/l)** $e^{(1.005(pH)-5.134)}$	8.7 pH = 7.0	6.7 pH = 7.0	13	7.9	2.8	82
pH See § 9VAC25-260-50						
Phenol (µg/l) 108952					21,000	4,600,000
Phosphorus Elemental (µg/l) 7723140				0.10		
Pyrene (µg/l) 129000					960	11,000
Radionuclides **Gross Alpha Particle Activity (pCi/L)** **Beta Particle & Photon Activity (mrem/yr)** (formerly man-made radio nuclides) **Strontium 90 (pCi/L)** **Tritium (pCi/L)**					15 4 8 20,000	15 4 8 20,000
Selenium (µg/l)[50] 7782492 WER shall not be used for freshwater acute and chronic criteria.	20	5.0	300 WER=1	71 WER=1	170	11,000
Silver (µg/l)[5] 7440224 Freshwater values are a function of total hardness as calcium carbonate ($CaCO_3$) mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400.	3.4 WER=1; $CaCO_3$= 100		2.0 WER=1			

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
Freshwater acute criterion (µg/l) $WER\left[e^{\{1.72[\ln(\text{hardness})]-6.52\}}\right](CF_a)$ WER = Water Effect Ratio = 1 unless shown otherwise under 9 VAC 25-260-140.F and listed in 9 VAC 25-260-310 e = natural antilogarithm ln = natural logarithm $(CF_a) = 0.85$						
Sulfate (µg/l) Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.					250,000	
Temperature See 9 VAC 25-260-50						
1,1,2,2-Tetrachloroethane (µg/l) 79345 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					1.7	110
Tetrachloroethylene (µg/l) 127184 Known or suspected carcinogen; human health criteria at risk level 10^{-5}					8.0	89
Thallium (µg/l) 7440280					1.7	6.3
Toluene (µg/l) 108883					6,800	200,000
Total Dissolved Solids (µg/l) Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.					500,000	
Toxaphene (µg/l) 8001352 The chronic aquatic life criteria have been calculated to also protect wildlife from harmful effects through ingestion of contaminated tissue. Known or suspected carcinogen; human health criteria at risk level 10^{-5}.	0.73	0.0002	0.21	0.0002	0.0073	0.0075
Tributyltin (µg/l) 60105	0.46	0.063	0.38	0.001		

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER			
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]	Public Water Supply[3]	All Other Surface Waters[4]
1, 2, 4 Trichlorobenzene (µg/l) 120821					260	940
1,1,2-Trichloroethane (µg/l) 79005 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					6.0	420
Trichloroethylene (µg/l) 79016 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					27	810
2, 4, 6 –Trichlorophenol 88062 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					21	65
2–(2, 4, 5 –Trichlorophenoxy propionic acid (Silvex) (µg/l)					50	
Vinyl Chloride (µg/l) 75014 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.23	61
Zinc (µg/l)[5] Freshwater values are a function of total hardness as calcium carbonate ($CaCO_3$) mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum, hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. **Freshwater acute criterion µg/l** $WER\left[e^{\{0.8473[\ln(hardness)]+0.884\}}\right](CF_a)$ **Freshwater chronic criterion µg/l** $WER\left[e^{\{0.8473[\ln(hardness)]+0.884\}}\right](CF_c)$ WER = Water Effect Ratio = 1 unless shown otherwise under 9 VAC 25-260-140.F and listed in 9 VAC 25-260-310 e = base e exponential function. ln = log normal function CF_a = 0.978 CF_c = 0.986	120 WER=1 $CaCO_3$= 100	120 WER=1 $CaCO_3$= 100	90 WER=1	81 WER=1	9,100	69,000

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Massaponnax WWTP Permit No.: VA0025658

Receiving Stream: Rappahannock River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	50 mg/L
90% Temperature (Annual) =	28 deg C
90% Temperature (Wet season) =	14 deg C
90% Maximum pH =	7.6 SU
10% Maximum pH =	SU
Tier Designation (1 or 2) =	1
Public Water Supply (PWS) Y/N? =	n
Trout Present Y/N? =	n
Early Life Stages Present Y/N? =	y

Stream Flows

1Q10 (Annual) =	1 MGD
7Q10 (Annual) =	1 MGD
30Q10 (Annual) =	1 MGD
1Q10 (Wet season) =	1 MGD
30Q10 (Wet season)	1 MGD
30Q5 =	1 MGD
Harmonic Mean =	1 MGD
Annual Average =	na MGD

Mixing Information

Annual - 1Q10 Mix =	100 %
- 7Q10 Mix =	100 %
- 30Q10 Mix =	100 %
Wet Season - 1Q10 Mix =	100 %
- 30Q10 Mix =	100 %

Effluent Information

Mean Hardness (as CaCO3) =	50 mg/L
90% Temp (Annual) =	deg C
90% Temp (Wet season) =	deg C
90% Maximum pH =	SU
10% Maximum pH =	SU
Discharge Flow =	1 MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Acenapthene	0	--	--	na	2.7E+03	--	--	na	5.4E+03	--	--	--	--	--	--	--	--	--	--	na	5.4E+03
Acrolein	0	--	--	na	7.8E+02	--	--	na	1.6E+03	--	--	--	--	--	--	--	--	--	--	na	1.6E+03
Acrylonitrile [C]	0	--	--	na	6.6E+00	--	--	na	1.3E+01	--	--	--	--	--	--	--	--	--	--	na	1.3E+01
Aldrin [C]	0	3.0E+00	--	na	1.4E-03	6.0E+00	--	na	2.8E-03	--	--	--	--	--	--	--	--	6.0E+00	--	na	2.8E-03
Ammonia-N (mg/l) (Yearly)	0	5.84E+01	7.09E+00	na	--	1.2E+02	1.4E+01	na	--	--	--	--	--	--	--	--	--	1.2E+02	1.4E+01	na	--
Ammonia-N (mg/l) (High Flow)	0	5.84E+01	7.09E+00	na	--	1.2E+02	1.4E+01	na	--	--	--	--	--	--	--	--	--	1.2E+02	1.4E+01	na	--
Anthracene	0	--	--	na	1.1E+05	--	--	na	2.2E+05	--	--	--	--	--	--	--	--	--	--	na	2.2E+05
Antimony	0	--	--	na	4.3E+03	--	--	na	8.6E+03	--	--	--	--	--	--	--	--	--	--	na	8.6E+03
Arsenic	0	3.4E+02	1.5E+02	na	--	6.8E+02	3.0E+02	na	--	--	--	--	--	--	--	--	--	6.8E+02	3.0E+02	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Benzene [C]	0	--	--	na	7.1E+02	--	--	na	1.4E+03	--	--	--	--	--	--	--	--	--	--	na	1.4E+03
Benzidine [C]	0	--	--	na	5.4E-03	--	--	na	1.1E-02	--	--	--	--	--	--	--	--	--	--	na	1.1E-02
Benzo (a) anthracene [C]	0	--	--	na	4.9E-01	--	--	na	9.8E-01	--	--	--	--	--	--	--	--	--	--	na	9.8E-01
Benzo (b) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	9.8E-01	--	--	--	--	--	--	--	--	--	--	na	9.8E-01
Benzo (k) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	9.8E-01	--	--	--	--	--	--	--	--	--	--	na	9.8E-01
Benzo (a) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	9.8E-01	--	--	--	--	--	--	--	--	--	--	na	9.8E-01
Bis2-Chloroethyl Ether	0	--	--	na	1.4E+01	--	--	na	2.8E+01	--	--	--	--	--	--	--	--	--	--	na	2.8E+01
Bis2-Chloroisopropyl Ether	0	--	--	na	1.7E+05	--	--	na	3.4E+05	--	--	--	--	--	--	--	--	--	--	na	3.4E+05
Bromoform [C]	0	--	--	na	3.6E+03	--	--	na	7.2E+03	--	--	--	--	--	--	--	--	--	--	na	7.2E+03
Butylbenzylphthalate	0	--	--	na	5.2E+03	--	--	na	1.0E+04	--	--	--	--	--	--	--	--	--	--	na	1.0E+04
Cadmium	0	1.8E+00	6.6E-01	na	--	3.6E+00	1.3E+00	na	--	--	--	--	--	--	--	--	--	3.6E+00	1.3E+00	na	--
Carbon Tetrachloride [C]	0	--	--	na	4.4E+01	--	--	na	8.8E+01	--	--	--	--	--	--	--	--	--	--	na	8.8E+01
Chlordane [C]	0	2.4E+00	4.3E-03	na	2.2E-02	4.8E+00	8.6E-03	na	4.4E-02	--	--	--	--	--	--	--	--	4.8E+00	8.6E-03	na	4.4E-02
Chloride	0	8.6E+05	2.3E+05	na	--	1.7E+06	4.6E+05	na	--	--	--	--	--	--	--	--	--	1.7E+06	4.6E+05	na	--
TRC	0	1.9E+01	1.1E+01	na	--	3.8E+01	2.2E+01	na	--	--	--	--	--	--	--	--	--	3.8E+01	2.2E+01	na	--
Chlorobenzene	0	--	--	na	2.1E+04	--	--	na	4.2E+04	--	--	--	--	--	--	--	--	--	--	na	4.2E+04

Attachment 10

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane[C]	0	--	--	na	3.4E+02	--	--	na	6.8E+02	--	--	--	--	--	--	--	--	--	--	na	6.8E+02
Chloroform [C]	0	--	--	na	2.9E+04	--	--	na	5.8E+04	--	--	--	--	--	--	--	--	--	--	na	5.8E+04
2-Chloronaphthalene	0	--	--	na	4.3E+03	--	--	na	8.6E+03	--	--	--	--	--	--	--	--	--	--	na	8.6E+03
2-Chlorophenol	0	--	--	na	4.0E+02	--	--	na	8.0E+02	--	--	--	--	--	--	--	--	--	--	na	8.0E+02
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	1.7E-01	8.2E-02	na	--	--	--	--	--	--	--	--	--	1.7E-01	8.2E-02	na	--
Chromium III	0	3.2E+02	4.2E+01	na	--	6.5E+02	8.4E+01	na	--	--	--	--	--	--	--	--	--	6.5E+02	8.4E+01	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	3.2E+01	2.2E+01	na	--	--	--	--	--	--	--	--	--	3.2E+01	2.2E+01	na	--
Chromium, Total	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Chrysene [C]	0	--	--	na	4.9E-01	--	--	na	9.8E-01	--	--	--	--	--	--	--	--	--	--	na	9.8E-01
Copper	0	7.0E+00	5.0E+00	na	--	1.4E+01	9.9E+00	na	--	--	--	--	--	--	--	--	--	1.4E+01	9.9E+00	na	--
Cyanide	0	2.2E+01	5.2E+00	na	2.2E+05	4.4E+01	1.0E+01	na	4.3E+05	--	--	--	--	--	--	--	--	4.4E+01	1.0E+01	na	4.3E+05
DDD [C]	0	--	--	na	8.4E-03	--	--	na	1.7E-02	--	--	--	--	--	--	--	--	--	--	na	1.7E-02
DDE [C]	0	--	--	na	5.9E-03	--	--	na	1.2E-02	--	--	--	--	--	--	--	--	--	--	na	1.2E-02
DDT [C]	0	1.1E+00	1.0E-03	na	5.9E-03	2.2E+00	2.0E-03	na	1.2E-02	--	--	--	--	--	--	--	--	2.2E+00	2.0E-03	na	1.2E-02
Demeton	0	--	1.0E-01	na	--	--	2.0E-01	na	--	--	--	--	--	--	--	--	--	--	2.0E-01	na	--
Dibenz(a,h)anthracene [C]	0	--	--	na	4.9E-01	--	--	na	9.8E-01	--	--	--	--	--	--	--	--	--	--	na	9.8E-01
Dibutyl phthalate	0	--	--	na	1.2E+04	--	--	na	2.4E+04	--	--	--	--	--	--	--	--	--	--	na	2.4E+04
Dichloromethane (Methylene Chloride) [C]	0	--	--	na	1.6E+04	--	--	na	3.2E+04	--	--	--	--	--	--	--	--	--	--	na	3.2E+04
1,2-Dichlorobenzene	0	--	--	na	1.7E+04	--	--	na	3.4E+04	--	--	--	--	--	--	--	--	--	--	na	3.4E+04
1,3-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	5.2E+03	--	--	--	--	--	--	--	--	--	--	na	5.2E+03
1,4-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	5.2E+03	--	--	--	--	--	--	--	--	--	--	na	5.2E+03
3,3-Dichlorobenzidine [C]	0	--	--	na	7.7E-01	--	--	na	1.5E+00	--	--	--	--	--	--	--	--	--	--	na	1.5E+00
Dichlorobromomethane [C]	0	--	--	na	4.6E+02	--	--	na	9.2E+02	--	--	--	--	--	--	--	--	--	--	na	9.2E+02
1,2-Dichloroethane [C]	0	--	--	na	9.9E+02	--	--	na	2.0E+03	--	--	--	--	--	--	--	--	--	--	na	2.0E+03
1,1-Dichloroethylene	0	--	--	na	1.7E+04	--	--	na	3.4E+04	--	--	--	--	--	--	--	--	--	--	na	3.4E+04
1,2-trans-dichloroethylene	0	--	--	na	1.4E+05	--	--	na	2.8E+05	--	--	--	--	--	--	--	--	--	--	na	2.8E+05
2,4-Dichlorophenol	0	--	--	na	7.9E+02	--	--	na	1.6E+03	--	--	--	--	--	--	--	--	--	--	na	1.6E+03
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,2-Dichloropropane [C]	0	--	--	na	3.9E+02	--	--	na	7.8E+02	--	--	--	--	--	--	--	--	--	--	na	7.8E+02
1,3-Dichloropropene	0	--	--	na	1.7E+03	--	--	na	3.4E+03	--	--	--	--	--	--	--	--	--	--	na	3.4E+03
Dieldrin [C]	0	2.4E-01	5.6E-02	na	1.4E-03	4.8E-01	1.1E-01	na	2.8E-03	--	--	--	--	--	--	--	--	4.8E-01	1.1E-01	na	2.8E-03
Diethyl Phthalate	0	--	--	na	1.2E+05	--	--	na	2.4E+05	--	--	--	--	--	--	--	--	--	--	na	2.4E+05
Di-2-Ethylhexyl Phthalate [C]	0	--	--	na	5.9E+01	--	--	na	1.2E+02	--	--	--	--	--	--	--	--	--	--	na	1.2E+02
2,4-Dimethylphenol	0	--	--	na	2.3E+03	--	--	na	4.6E+03	--	--	--	--	--	--	--	--	--	--	na	4.6E+03
Dimethyl Phthalate	0	--	--	na	2.9E+06	--	--	na	5.8E+06	--	--	--	--	--	--	--	--	--	--	na	5.8E+06
Di-n-Butyl Phthalate	0	--	--	na	1.2E+04	--	--	na	2.4E+04	--	--	--	--	--	--	--	--	--	--	na	2.4E+04
2,4 Dinitrophenol	0	--	--	na	1.4E+04	--	--	na	2.8E+04	--	--	--	--	--	--	--	--	--	--	na	2.8E+04
2-Methyl-4,6-Dinitrophenol	0	--	--	na	7.65E+02	--	--	na	1.5E+03	--	--	--	--	--	--	--	--	--	--	na	1.5E+03
2,4-Dinitrotoluene [C]	0	--	--	na	9.1E+01	--	--	na	1.8E+02	--	--	--	--	--	--	--	--	--	--	na	1.8E+02
Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) (ppq)	0	--	--	na	1.2E-06	--	--	na	na	--	--	--	--	--	--	--	--	--	--	na	na
1,2-Diphenylhydrazine [C]	0	--	--	na	5.4E+00	--	--	na	1.1E+01	--	--	--	--	--	--	--	--	--	--	na	1.1E+01
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	4.4E-01	1.1E-01	na	4.8E+02	--	--	--	--	--	--	--	--	4.4E-01	1.1E-01	na	4.8E+02
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	4.4E-01	1.1E-01	na	4.8E+02	--	--	--	--	--	--	--	--	4.4E-01	1.1E-01	na	4.8E+02
Endosulfan Sulfate	0	--	--	na	2.4E+02	--	--	na	4.8E+02	--	--	--	--	--	--	--	--	--	--	na	4.8E+02
Endrin	0	8.6E-02	3.6E-02	na	8.1E-01	1.7E-01	7.2E-02	na	1.6E+00	--	--	--	--	--	--	--	--	1.7E-01	7.2E-02	na	1.6E+00
Endrin Aldehyde	0	--	--	na	8.1E-01	--	--	na	1.6E+00	--	--	--	--	--	--	--	--	--	--	na	1.6E+00

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	--	--	na	2.9E+04	--	--	na	5.8E+04	--	--	--	--	--	--	--	--	--	--	na	5.8E+04
Fluoranthene	0	--	--	na	3.7E+02	--	--	na	7.4E+02	--	--	--	--	--	--	--	--	--	--	na	7.4E+02
Fluorene	0	--	--	na	1.4E+04	--	--	na	2.8E+04	--	--	--	--	--	--	--	--	--	--	na	2.8E+04
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	2.0E-02	na	--	--	--	--	--	--	--	--	--	--	2.0E-02	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	2.1E-03	1.0E+00	7.6E-03	na	4.2E-03	--	--	--	--	--	--	--	--	1.0E+00	7.6E-03	na	4.2E-03
Heptachlor Epoxide [C]	0	5.2E-01	3.8E-03	na	1.1E-03	1.0E+00	7.6E-03	na	2.2E-03	--	--	--	--	--	--	--	--	1.0E+00	7.6E-03	na	2.2E-03
Hexachlorobenzene [C]	0	--	--	na	7.7E-03	--	--	na	1.5E-02	--	--	--	--	--	--	--	--	--	--	na	1.5E-02
Hexachlorobutadiene [C]	0	--	--	na	5.0E+02	--	--	na	1.0E+03	--	--	--	--	--	--	--	--	--	--	na	1.0E+03
Hexachlorocyclohexane Alpha-BHC [C]	0	--	--	na	1.3E-01	--	--	na	2.6E-01	--	--	--	--	--	--	--	--	--	--	na	2.6E-01
Hexachlorocyclohexane Beta-BHC [C]	0	--	--	na	4.6E-01	--	--	na	9.2E-01	--	--	--	--	--	--	--	--	--	--	na	9.2E-01
Hexachlorocyclohexane Gamma-BHC [C] (Lindane)	0	9.5E-01	na	na	6.3E-01	1.9E+00	--	na	1.3E+00	--	--	--	--	--	--	--	--	1.9E+00	--	na	1.3E+00
Hexachlorocyclopentadiene	0	--	--	na	1.7E+04	--	--	na	3.4E+04	--	--	--	--	--	--	--	--	--	--	na	3.4E+04
Hexachloroethane [C]	0	--	--	na	8.9E+01	--	--	na	1.8E+02	--	--	--	--	--	--	--	--	--	--	na	1.8E+02
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	4.0E+00	na	--	--	--	--	--	--	--	--	--	--	4.0E+00	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	9.8E-01	--	--	--	--	--	--	--	--	--	--	na	9.8E-01
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Isophorone [C]	0	--	--	na	2.6E+04	--	--	na	5.2E+04	--	--	--	--	--	--	--	--	--	--	na	5.2E+04
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Lead	0	4.9E+01	5.6E+00	na	--	9.8E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	9.8E+01	1.1E+01	na	--
Malathion	0	--	1.0E-01	na	--	--	2.0E-01	na	--	--	--	--	--	--	--	--	--	--	2.0E-01	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	na	5.1E-02	2.8E+00	1.5E+00	na	1.0E-01	--	--	--	--	--	--	--	--	2.8E+00	1.5E+00	na	1.0E-01
Methyl Bromide	0	--	--	na	4.0E+03	--	--	na	8.0E+03	--	--	--	--	--	--	--	--	--	--	na	8.0E+03
Methoxychlor	0	--	3.0E-02	na	--	--	6.0E-02	na	--	--	--	--	--	--	--	--	--	--	6.0E-02	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Monochlorobenzene	0	--	--	na	2.1E+04	--	--	na	4.2E+04	--	--	--	--	--	--	--	--	--	--	na	4.2E+04
Nickel	0	1.0E+02	1.1E+01	na	4.6E+03	2.0E+02	2.3E+01	na	9.2E+03	--	--	--	--	--	--	--	--	2.0E+02	2.3E+01	na	9.2E+03
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Nitrobenzene	0	--	--	na	1.9E+03	--	--	na	3.8E+03	--	--	--	--	--	--	--	--	--	--	na	3.8E+03
N-Nitrosodimethylamine [C]	0	--	--	na	8.1E+01	--	--	na	1.6E+02	--	--	--	--	--	--	--	--	--	--	na	1.6E+02
N-Nitrosodiphenylamine [C]	0	--	--	na	1.6E+02	--	--	na	3.2E+02	--	--	--	--	--	--	--	--	--	--	na	3.2E+02
N-Nitrosodi-n-propylamine [C]	0	--	--	na	1.4E+01	--	--	na	2.8E+01	--	--	--	--	--	--	--	--	--	--	na	2.8E+01
Parathion	0	6.5E-02	1.3E-02	na	--	1.3E-01	2.6E-02	na	--	--	--	--	--	--	--	--	--	1.3E-01	2.6E-02	na	--
PCB-1016	0	--	1.4E-02	na	--	--	2.8E-02	na	--	--	--	--	--	--	--	--	--	--	2.8E-02	na	--
PCB-1221	0	--	1.4E-02	na	--	--	2.8E-02	na	--	--	--	--	--	--	--	--	--	--	2.8E-02	na	--
PCB-1232	0	--	1.4E-02	na	--	--	2.8E-02	na	--	--	--	--	--	--	--	--	--	--	2.8E-02	na	--
PCB-1242	0	--	1.4E-02	na	--	--	2.8E-02	na	--	--	--	--	--	--	--	--	--	--	2.8E-02	na	--
PCB-1248	0	--	1.4E-02	na	--	--	2.8E-02	na	--	--	--	--	--	--	--	--	--	--	2.8E-02	na	--
PCB-1254	0	--	1.4E-02	na	--	--	2.8E-02	na	--	--	--	--	--	--	--	--	--	--	2.8E-02	na	--
PCB-1260	0	--	1.4E-02	na	--	--	2.8E-02	na	--	--	--	--	--	--	--	--	--	--	2.8E-02	na	--
PCB Total [C]	0	--	--	na	1.7E-03	--	--	na	3.4E-03	--	--	--	--	--	--	--	--	--	--	na	3.4E-03

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Pentachlorophenol [C]	0	7.7E-03	5.9E-03	na	8.2E+01	1.5E-02	1.2E-02	na	1.6E+02	--	--	--	--	--	--	--	--	**1.5E-02**	**1.2E-02**	**na**	**1.6E+02**
Phenol	0	--	--	na	4.6E+06	--	--	na	9.2E+06	--	--	--	--	--	--	--	--	--	--	**na**	**9.2E+06**
Pyrene	0	--	--	na	1.1E+04	--	--	na	2.2E+04	--	--	--	--	--	--	--	--	--	--	**na**	**2.2E+04**
Radionuclides (pCi/l except Beta/Photon)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	**na**	--
Gross Alpha Activity	0	--	--	na	1.5E+01	--	--	na	3.0E+01	--	--	--	--	--	--	--	--	--	--	**na**	**3.0E+01**
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	8.0E+00	--	--	--	--	--	--	--	--	--	--	**na**	**8.0E+00**
Strontium-90	0	--	--	na	8.0E+00	--	--	na	1.6E+01	--	--	--	--	--	--	--	--	--	--	**na**	**1.6E+01**
Tritium	0	--	--	na	2.0E+04	--	--	na	4.0E+04	--	--	--	--	--	--	--	--	--	--	**na**	**4.0E+04**
Selenium	0	2.0E+01	5.0E+00	na	1.1E+04	4.0E+01	1.0E+01	na	2.2E+04	--	--	--	--	--	--	--	--	**4.0E+01**	**1.0E+01**	**na**	**2.2E+04**
Silver	0	1.0E+00	--	na	--	2.1E+00	--	na	--	--	--	--	--	--	--	--	--	**2.1E+00**	--	**na**	--
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	**na**	--
1,1,2,2-Tetrachloroethane [C]	0	--	--	na	1.1E+02	--	--	na	2.2E+02	--	--	--	--	--	--	--	--	--	--	**na**	**2.2E+02**
Tetrachloroethylene [C]	0	--	--	na	8.9E+01	--	--	na	1.8E+02	--	--	--	--	--	--	--	--	--	--	**na**	**1.8E+02**
Thallium	0	--	--	na	6.3E+00	--	--	na	1.3E+01	--	--	--	--	--	--	--	--	--	--	**na**	**1.3E+01**
Toluene	0	--	--	na	2.0E+05	--	--	na	4.0E+05	--	--	--	--	--	--	--	--	--	--	**na**	**4.0E+06**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	**na**	--
Toxaphene [C]	0	7.3E-01	2.0E-04	na	7.5E-03	1.5E+00	4.0E-04	na	1.5E-02	--	--	--	--	--	--	--	--	**1.5E+00**	**4.0E-04**	**na**	**1.5E-02**
Tributyltin	0	4.6E-01	6.3E-02	na	--	9.2E-01	1.3E-01	na	--	--	--	--	--	--	--	--	--	**9.2E-01**	**1.3E-01**	**na**	--
1,2,4-Trichlorobenzene	0	--	--	na	9.4E+02	--	--	na	1.9E+03	--	--	--	--	--	--	--	--	--	--	**na**	**1.9E+03**
1,1,2-Trichloroethane [C]	0	--	--	na	4.2E+02	--	--	na	8.4E+02	--	--	--	--	--	--	--	--	--	--	**na**	**8.4E+02**
Trichloroethylene [C]	0	--	--	na	8.1E+02	--	--	na	1.6E+03	--	--	--	--	--	--	--	--	--	--	**na**	**1.6E+03**
2,4,6-Trichlorophenol [C]	0	--	--	na	6.5E+01	--	--	na	1.3E+02	--	--	--	--	--	--	--	--	--	--	**na**	**1.3E+02**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	**na**	--
Vinyl Chloride [C]	0	--	--	na	6.1E+01	--	--	na	1.2E+02	--	--	--	--	--	--	--	--	--	--	**na**	**1.2E+02**
Zinc	0	6.5E+01	6.6E+01	na	6.9E+04	1.3E+02	1.3E+02	na	1.4E+05	--	--	--	--	--	--	--	--	**1.3E+02**	**1.3E+02**	**na**	**1.4E+05**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Mixing ratios may be substituted for stream flows where appropriate.

Metal	Target Value (SSTV)
Antimony	8.6E+03
Arsenic	1.8E+02
Barium	na
Cadmium	7.9E-01
Chromium III	5.0E+01
Chromium VI	1.3E+01
Copper	5.6E+00
Iron	na
Lead	6.7E+00
Manganese	na
Mercury	1.0E-01
Nickel	1.4E+01
Selenium	6.0E+00
Silver	8.4E-01
Zinc	5.2E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

1.000 MGD DISCHARGE FLOW - STREAM MIX PER "Mix.exe"

Discharge Flow Used for WQS-WLA Calculations (MGI 1.000

	Stream Flows Allocated to Mix (MGD)		Total Mix Flows Stream + Discharge (MGD)	
	Dry Season	Wet Season	Dry Season	Wet Season
1Q10	1.000	1.000	2.000	2.000
7Q10	1.000	N/A	2.000	N/A
30Q10	1.000	1.000	2.000	2.000
30Q5	1.000	N/A	2.000	N/A
Harm. Mean	1.000	N/A	2.000	N/A
Annual Avg.	na	N/A	#VALUE!	N/A

Stream/Discharge Mix Values

	Dry Season	Wet Season
1Q10 90th% Temp. Mix (deg C)	14.000	7.000
30Q10 90th% Temp. Mix (deg C)	14.000	7.000
1Q10 90th% pH Mix (SU)	0.301	0.301
30Q10 90th% pH Mix (SU)	0.301	0.301
1Q10 10th% pH Mix (SU)	0.000	N/A
7Q10 10th% pH Mix (SU)	0.000	N/A

	Calculated	Formula Inputs
1Q10 Hardness (mg/L as CaCO3)	50.0	50.0
7Q10 Hardness (mg/L as CaCO3)	50.0	50.0

Ammonia - Dry Season - Acute

90th Percentile pH (SU)	0.301
(7.204 - pH)	6.903
(pH - 7.204)	-6.903
Trout Present Criterion (mg N/l	39.000
Trout Absent Criterion (mg N/L	58.400
Trout Present?	n
Effective Criterion (mg N/L)	58.400

Ammonia - Dry Season - Chronic

90th Percentile Temp. (deg C)	14.000
90th Percentile pH (SU)	0.301
MIN	2.850
MAX	14.000
(7.688 - pH)	7.387
(pH - 7.688)	-7.387
Early LS Present Criterion (mg N	7.088
Early LS Absent Criterion (mg N/	7.329
Early Life Stages Present?	y
Effective Criterion (mg N/L)	7.088

Ammonia - Wet Season - Acute

90th Percentile pH (SU)	0.301
(7.204 - pH)	6.903
(pH - 7.204)	-6.903
Trout Present Criterion (mg N/l	39.000
Trout Absent Criterion (mg N/L	58.400
Trout Present?	n
Effective Criterion (mg N/L)	58.400

Ammonia - Wet Season - Chronic

90th Percentile Temp. (deg C)	7.000
90th Percentile pH (SU)	0.301
MIN	2.850
MAX	7.000
(7.688 - pH)	7.387
(pH - 7.688)	-7.387
Early LS Present Criterion (mg N	7.088
Early LS Absent Criterion (mg N/	11.509
Early Life Stages Present?	y
Effective Criterion (mg N/L)	7.088

1.000 MGD DISCHARGE FLOW - COMPLETE STREAM MIX

Discharge Flow Used for WQS-WLA Calculations (MGI 1.000

	100% Stream Flows Allocated to Mix (MGD)		Total Mix Flows Stream + Discharge (MGD)	
	Dry Season	Wet Season	Dry Season	Wet Season
1Q10	1.000	1.000	2.000	2.000
7Q10	1.000	N/A	2.000	N/A
30Q10	1.000	1.000	2.000	2.000
30Q5	1.000	N/A	2.000	N/A
Harm. Mean	1.000	N/A	2.000	N/A
Annual Avg.	na	N/A	#VALUE!	N/A

Stream/Discharge Mix Values

	Dry Season	Wet Season
1Q10 90th% Temp. Mix (deg C)	14.000	7.000
30Q10 90th% Temp. Mix (deg C)	14.000	7.000
1Q10 90th% pH Mix (SU)	0.301	0.301
30Q10 90th% pH Mix (SU)	0.301	0.301
1Q10 10th% pH Mix (SU)	0.000	N/A
7Q10 10th% pH Mix (SU)	0.000	N/A

	Calculated	Formula Inputs
1Q10 Hardness (mg/L as CaCO3) =	50.000	50.000
7Q10 Hardness (mg/L as CaCO3) =	50.000	50.000

Ammonia - Dry Season - Acute

90th Percentile pH (SU)	0.301
(7.204 - pH)	6.903
(pH - 7.204)	-6.903
Trout Present Criterion (mg N/l	39.000
Trout Absent Criterion (mg N/L	58.400
Trout Present?	n
Effective Criterion (mg N/L)	58.400

Ammonia - Dry Season - Chronic

90th Percentile Temp. (deg C)	14.000
90th Percentile pH (SU)	0.301
MIN	2.850
MAX	14.000
(7.688 - pH)	7.387
(pH - 7.688)	-7.387
Early LS Present Criterion (mg N	7.088
Early LS Absent Criterion (mg N/	7.329
Early Life Stages Present?	y
Effective Criterion (mg N/L)	7.088

Ammonia - Wet Season - Acute

90th Percentile pH (SU)	0.301
(7.204 - pH)	6.903
(pH - 7.204)	-6.903
Trout Present Criterion (mg N/l	39.000
Trout Absent Criterion (mg N/L	58.400
Trout Present?	n
Effective Criterion (mg N/L)	58.400

Ammonia - Wet Season - Chronic

90th Percentile Temp. (deg C)	7.000
90th Percentile pH (SU)	0.301
MIN	2.850
MAX	7.000
(7.688 - pH)	7.387
(pH - 7.688)	-7.387
Early LS Present Criterion (mg N	7.088
Early LS Absent Criterion (mg N/	11.509
Early Life Stages Present?	y
Effective Criterion (mg N/L)	7.088

Attachment 11

August 24, 2006
MEMORANDUM

TO:	Virginia Institute of Marine Science (VIMS) Model for the Tidal Rappahannock File
FROM:	Alison Thompson, Water Permitting - NVRO
SUBJECT:	Virginia Institute of Marine Science Model for the Tidal Rappahannock. Input Assumptions and Summaries through August 2006

This memo summarizes all of the VIMS model inputs, assumptions, and results made to date, documenting the use of and decisions reached with the model.

The last update of this memo dated January 2005, was the model run for the expansion of the Little Falls Run STP from 8.0 MGD to 13.0 MGD. In addition, staff made drastic changes to the VIMS point source inputs due to the regulatory initiatives regarding nutrient loadings to the Chesapeake Bay. This run accounted for the status of the nutrient regulations in January 2005.

Background

Stafford County, Spotsylvania County, and the City of Fredericksburg funded a water quality model for the upper Rappahannock River estuary developed by the Virginia Institute of Marine Science (VIMS), entitled A Modeling Study of the Water Quality of the Upper Rappahannock River (VIMS Model). This model was approved by the State Water Control Board Director on December 6, 1991. This model is used to determine effluent limitations for new and expanded discharge requests in the upper Rappahannock River, from the fall line at Fredericksburg to the Rt. 301 Bridge in King George County. VIMS documentation of the model is contained in *A Modeling Study of the Water Quality of the Upper Rappahannock River*, October 1991. A copy of the report as well as the program and general correspondence is contained in the Department of Environmental Quality (DEQ) Northern Virginia Regional Office (NVRO) Rappahannock Model File.

There are 32 river miles between the fall line and the Rt. 301 Bridge. The model divides this 32 mile segment of the river into 33 model segments (see Figure 1 for discharger locations). The following point source discharges are included in the current model run:

Segment 3:	Fredericksburg STP	VA0025127	4.5 MGD
Segment 4:	FMC WWTP	VA0068110	5.4 MGD
Segment 9:	Little Falls Run STP	VA0076392	13.0 MGD
	Massaponax STP	VA0025658	8.0 MGD
Segment 16:	Greenhost Village Farms	VA0090654	1.0 MGD
Segment 20:	Four Winds Campground	VA0060429	0.210 MGD
Segment 23:	Hopyard Farm WWTP	VA0089338	0.50 MGD
Segment 26:	Haymount STP	VA0089125	0.96 MGD

Regulations affecting the VIMS model inputs

The 2006 303(d)/305(b) Integrated Report includes the Virginia portions of the Chesapeake Bay and its tributaries in the List of Impaired Waters (Category 5) for not meeting the aquatic life use support goal.

The IR indicates that 83% of the mainstem Bay does not support the aquatic life use support goal. Nutrient enrichment is cited as one of the primary causes of impairment.

Virginia has committed to protecting and restoring the Bay and its tributaries. Currently the Agency has developed nutrient water quality standards for the Bay and its tributaries, amended the Nutrient Policy (9 VAC 25-40-10) to govern the inclusion of technology-based, numerical nitrogen and phosphorus limits in VPDES permits, and a parallel effort updating and amending the Water Quality Management Planning (WQMP) regulation 9 VAC 25-720. The Water Quality Standards for the Bay were adopted in March 2005. The WQMP regulation includes Total Nitrogen and Total Phosphorus Wasteload Allocations for all Chesapeake Bay Program Significant Discharge List (CBP SDL) discharges.

The total phosphorous loadings based on the Nutrient Policy and/or from the WQMP for the applicable facilities are as follows:

Fredericksburg STP (4.5 MGD; 0.3 mg/L)*	4,109 lb/year
FMC WWTP (5.4 MGD; 0.3 mg/L)	4,934 lb/year
Little Falls Run STP (8.0 MGD; 0.3 mg/L)	7,309 lb/year
Massaponax STP (8.0 MGD; 0.3 mg/L)	7,309 lb/year
Four Winds Campground (0.21 MGD)	640 lb/year. Not in the WQMP, but must meet 1.0 mg/L annual average
Haymount STP (0.96 MGD; 0.3 mg/L)	877 lb/year
Hopyard Farm WWTP (0.5 MGD; 0.3 mg/L)	457 lb/year

The total nitrogen loadings based on the Nutrient Policy and from the WQMP for the applicable facilities are as follows:

Fredericksburg STP (4.5 MGD; 4.0 mg/L)*	54,794 lb/year
FMC WWTP (5.4 MGD; 4.0 mg/L)	65,784 lb/year
Little Falls Run STP (8.0 MGD; 4.0 mg/L)	97,458 lb/year
Massaponax STP (8.0 MGD; 4.0 mg/L)	97,458 lb/year
Four Winds Campground (0.21 MGD)	5100 lb/year. Not in the WQMP, but must meet 8.0 mg/L annual average
Haymount STP (0.96 MGD; 4.0 mg/L)	11,695 lb/year
Hopyard Farm WWTP (0.5 MGD)	6091 lb/year.

*Note: The loadings for the City of Fredericksburg's WWTP are based on a flow of 3.5 MGD, but will be amended to reflect the current permitted flow of 4.5 MGD.

In addition to the nutrient initiatives, the changes to the Water Quality Standards for the Chespeake Bay and tidal waters included criteria for dissolved oxygen, water clarity, chlorophyll a, and Designated Uses. The dissolved oxygen standard for migratory fish waters for the months of February through May is a minimum of 6.0 mg/L. For the months of June through January, the minimum is 5.5 mg/L. These dissolved oxygen criteria apply to the upper tidal portion of the Rappahannock River.

RADCO 208 Plan

The Rappahannock Area Development Commission (RADCO) 208 Area Waste Treatment Management Plan was adopted in August 1977, was amended in September 1983, and was repealed in 2004. The loading allocations in it had to be maintained until the Plan was repealed. The loading allocations in the Plan were based on an old water quality model, AUTO$$, that was replaced in 1991 by the VIMS model.

The VIMS model has demonstrated that nutrients are the primary factor for water quality in the upper tidal Rappahannock River. Numerous runs of the model have demonstrated that cBOD is not as influential as the nutrients at the maximum permitted flows of each POTW. As such, cBOD loadings are permissible above the levels specified in the old RADCO Plan.

Model Timeline

To date the model has been run seven times, each being necessitated by a request for a flow increase or for a new discharge. The runs are as follows:

1. August 14, 1995	- expansion of Fredericksburg STP from 3.5 to 4.5 MGD - addition of 0.93 MGD Haymount STP in Caroline County
2. August 22, 1996	- addition of 0.25 MGD Hopyard Farm WWTP in King George County
3. March 17, 1997	- flow increase and production increase at White Packing
4. April 7, 1999	- expansion of Little Falls Run STP from 4.0 to 8.0 MGD - expansion of Massaponax STP from 6.0 to 8.0 MGD
5. December 1, 2000	- expansion of FMC WWTP from 4.0 to 5.4 MGD
6. April 29, 2003	- expansion of the proposed Hopyard Farm WWTP from 0.25 to 0.50 MGD.
7. January 26, 2005	-remove White Packing from Segment 26 since the facility is closed -correction of Haymount STP flow to 0.96 (previously was 0.93) -addition of 1.0-MGD Greenhost – Village Farms in King George County -expansion of Little Falls Run STP from 8.0 to 13.0 MGD -incorporation of the WQMP nutrient loadings for the Significant Dischargers
8. August 2006	- correct nutrient loadings for the City of Fredericksburg

The initial run on August 14, 1995, has been considered the background condition for the river segments. The VIMS files located at DEQ-NVRO contain the supporting documentation for the original model inputs and the subsequent model runs. With each successive run of the model, all parameters had been kept constant except those affected by the request necessitating the model run. The most recent model runs affected a change to the nutrient loadings for all the dischargers.

Antidegradation Analysis

With each running of the model, and/or permit action concerning this section of the Rappahannock River, an antidegradation analysis has been conducted in accordance with the water quality standards and DEQ guidance. This is a difficult task since the assessment and designation of Tier I or Tier II waters is partially subjective given the narrative criteria of the standards, water quality data are not static, and waterbody boundaries are not well defined.

Since the onset of using this model, the established model segments have been used, by default, to define river sections into individual waterbodies for the antidegradation analysis. DEQ did not suggest or contend that these model segments should be used for other water quality management purposes. It was recognized that the river from the fall line down to the Rt. 301 Bridge could have been, and perhaps should have been, considered one waterbody segment. DEQ also acknowledged that this whole segment of the Rappahannock River could have been assessed as Tier I since it is considered nutrient enriched and turbid and therefore subject to corrective plans outlined in the *1999 Tributary Strategy for the Rappahannock River and Northern Neck Coastal Basins*. However, being uncertain DEQ elected to evaluate antidegradation, as through each of the model segments were actual distinct waterbodies. This approach was conservative in terms of protecting water quality and to date did not prove to be an undo burden to any of the dischargers.

Historically, four segments were identified as Tier II through this process: segment 16, segment 20, segment 23, and segment 26. Each was identified through separate permit actions that did not initially involve the VIMS model. When a segment was analyzed as Tier II, two parameters generally were assessed, ammonia and dissolved oxygen (DO). Ammonia levels were kept below the baselines and DO was kept to no lower than 0.2 mg/L of the concentration predicted in the August 14, 1995 background model run.

The VIMS memo dated April 29, 2003 contains the historical summary and table of the baselines of the Tier determinations for each of the four segments.

For the purposes of this model run, the entire Rappahannock River will be considered Tier I. The previous determination of Tier II ratings for segments 16, 20, 23, and 26 were made with adherence to guidance with little best professional judgement by staff. It has been 10 years since the initial runs of the model and staff no longer believes it appropriate to assign a tier rating for each model segment. That instead it is not best to rate the whole segment from the fall line to the Route 301 bridge as one segment. The nutrient enrichment problems of this segment, as evident by high turbidity, warrants a Tier I rating. Staff again makes this determination for the sole purpose of assigning permit limits. And since the Tier ratings have had very little influence on the results of the model, there is no measurable consequence to this change, and there is no need to continue to assess these segments (16, 20, 23, and 26) as being different from the whole river segment.

It should be noted that the predicted concentrations of dissolved oxygen and ammonia are significantly different in this current model run than what was considered the "background" concentrations. With the new loading allocations to the significant discharges in place, the model predicts that chlorophyll concentrations will be significantly less than what prior model runs have predicted and the artificially elevated levels of dissolved oxygen (nutrients stimulate chlorophyll growth and chlorophyll photosynthesis generates dissolved oxygen) are no longer predicted. Further discussion of chlorophyll a is found in the next section.

Total Phosphorous Loading Cap (historical perspective)

All of the above facilities discharge into one of the State's nutrient enriched water – Tidal freshwater Rappahannock River from the fall line to Buoy 44 near Leedstown, Virginia, including all tributaries to their headwaters that enter the tidal freshwater Rappahannock River. All dischargers into nutrient enriched waters as designated in the Water Quality Standards for Nutrient Enriched Waters that were permitted before July 1, 1988, and that discharge 1 MGD or more are subject to the Policy for Nutrient Enriched Waters. This policy requires facilities to meet a monthly average Total Phosphorous limitations of 2.0 mg/L and to monitor for monthly average Total Nitrogen concentration and loading values.

Based on the prior VIMS model runs, the chlorophyll a levels in the upper segments of the river in the Fredericksburg area approached 100 ug/L under design conditions. High chlorophyll a concentrations and the corresponding high alga growth mask dissolved oxygen depletion due to BOD loading. Further, the model demonstrated that chlorophyll a concentrations increased with additional phosphorous (P) loadings. If P limits for the expanding STPs were based solely on the Nutrient Policy, 2 mg/L, then chlorophyll a levels would exceed 120 ug/L in the waters around Fredericksburg. To prevent further increases in chlorophyll a concentrations in this part of the river, total phosphorous loadings (mass based, kg/day) were

not allowed to increase for the Fredericksburg, FMC, Massaponax, and Little Falls Run wastewater treatment plants beyond the current limits. All future requests for flow increases at these facilities required that the P mass limits remain constant at the current loading limits. Permitted phosphorous concentration limits may remain at the same level prescribed by the Nutrient Policy, 2 mg/L, since it is the total mass loading that impacts chlorophyll levels. However, as effluent flows increase, in order to meet the mass limitations, effluent concentrations had to be below the 2 mg/L limit.

The relationship of how chlorophyll photosynthesis affects dissolved oxygen levels has been explored in this model and it was worth recognizing what historical baseline/initial levels were. These values were useful in the subsequent model runs for tracking how nutrients inflated dissolved oxygen levels (nutrients stimulate chlorophyll growth and chlorophyll photosynthesis generates dissolved oxygen).

DEQ is in the process of adopting a chlorophyll a narrative standard that states, "Concentrations of chlorophyll a in free-floating microscopic aquatic plants (algae) shall not exceed levels that result in undesirable or nuisance aquatic plant life, or render tidal waters unsuitable for the propagation and growth of a balanced, indigenous population of aquatic life or otherwise result in ecologically undesirable water quality conditions such as reduced water clarity, low dissolved oxygen, food supply imbalances, proliferation of species deemed potentially harmful to aquatic life or humans or aesthetically objectionable conditions."

Summary of past model runs

In the 1995 VIMS model, the winter inputs for ammonia and organic nitrogen for all wastewater treatment plants were 14 mg/L ammonia and 14 mg/L organic nitrogen. These values represented little to no nitrification. The model indicated that there were no far field violations of the winter ammonia standards. Therefore, no winter ammonia or TKN limits were established for Fredericksburg, FMC, Massaponax, and Little Falls Run wastewater treatment plants. The acute ammonia criterion for the winter months was 12.07 mg/L. DEQ did not impose winter acute based ammonia limits on any of the treatment plants for the following reasons: the discharges are located near the fall line where tidal influences are the smallest; the net advective flow of the river dominates the tidal influence; the design flows are much smaller than the critical flows of the river; ammonia decays rather rapidly; and each of the plants were achieving varying degrees of nitrification.

During the April 7, 1999 model run, winter ammonia loading had to be lowered for Little Falls Run and Massaponax from 14 mg/L to 12 mg/L in order to meet the antidegradation baselines in segment 23 and 26. Since organic nitrogen would also decrease during the nitrification process, its input into the model was also lowered to 12 mg/L for both dischargers. During this model run, the winter ammonia loadings for FMC were also lowered to 12 mg/L to meet the antidegradation baselines of segments 16, 23, and 26. At the new flows for FMC, water quality criteria and antidegradation baselines are still protective for the summer months of May – October. Since organic nitrogen would also decrease during the nitrification process, its input into the model was also lowered to 12 mg/L for FMC. Acute based ammonia limits were imposed at the new flows for the same reasons cited above. However, since the new model inputs were lower than the acute ammonia water quality standard of 12.07 mg/L, it was certain that the acute standard was protected in the winter.

In the December 1, 2000 model run, two minor data entry problems were corrected in conjunction with the expansion of FMC to 5.4 MGD. First, in the original model documentation memorandum of August 14, 1995, the assumption was made that total effluent nitrogen levels for these types of plants would be 30 mg/L, and that it would exist in the form of organic nitrogen, ammonia, and/or inorganic nitrogen depending on the facility's ability to nitrify. This can be seen on page 1 under the section "Assumptions for nitrogen". However, the value shown for the three separate nitrogen parts add up to 32 mg/L. It was felt that this was a simple oversight at the time. Additionally, during the April 7, 1999 model run, nitrate-nitrite levels were increased to 21 mg/L and 24 mg/L for the Little Falls Run and Massaponax dischargers respectively, even though the ammonia nitrogen levels were set at 12 mg/L. Therefore, in order to maintain the original model assumptions, winter nitrate input levels were reset to 6 mg/L during this run for Little Falls Run, Massaponax, and FMC. Since the Fredericksburg inputs had not been adjusted, nor had they recently been adjusted, the original values were maintained (14 mg/L organic-N, 14 mg/L Ammonia-N, and 4 mg/L Nitrate/Nitrite). Second, the ammonia loadings for the Haymount STP were incorrectly entered as

8.61 kg/d. The correct loading was entered as 3.53 kg/d. This correction had little to no impact on the model outputs.

In the April 29, 2003, model run all numerical criteria are met and all antidegradation baselines for ammonia and DO were met except for one. In the winter run, segment 23 (Hopyard Farm) yields a DO of 7.43 mg/L. The baseline for DO in this segment is 7.47 mg/L. In order to maintain the additional 0.04 mg/L of DO, the BOD concentrations of Hopyard Farm and the upstream dischargers would have to be significantly reduced. DEQ did not believe this reduction was warranted since the model was run based on design capacity flows for all facilities and not just for Hopyard Farm. In addition, the DO deficit for segment 23 actually improved from 0.07 mg/L to 0.04 mg/L with the increase in Hopyard Farm's flows. Therefore, changes to the effluent limits were not necessary for such a small change in DO since the model is not that sensitive or accurate.

In January 2005, the model run was conducted to include the expansion of the Little Falls Run STP, the removal of White Packing, the correction of the Haymount STP flow, and the addition of Greenhost – Village Farms because of observed nutrient concentrations in the discharge. This model run also assumed that the Nutrient Policy and the WQMP regulation were adopted. Effluent loadings for $cBOD_5$ and Dissolved Oxygen were derived by multiplying the current concentration limits by the maximum permitted flow. For the facilities that are contained in the draft WQMP regulation, nutrient loadings were derived using the flows and loadings presented in draft regulation. For Four Winds Campground, nutrient loadings were derived using a total nitrogen concentration of 8.0 mg/L and a total phosphorus concentration of 1.0 mg/L based on the draft Nutrient Policy. For Hopyard Farm WWTP, nutrient loadings were derived using a total nitrogen concentration of 4.0 mg/L and a total phosphorus concentration of 0.3 mg/L based on the draft WQMP. Best professional judgement and actual effluent data were used to determine the loadings for Greenhost- Village Farms.

Current Model Run Summary

The model was run once for both summer (May- October) and winter (November-April). This Model Run is considered the new baseline, because the inputs best represent the critical conditions once the facilities are meeting the requirements of the nutrient regulations.

Summer continues to be the critical period for the water quality of the Rappahannock River because stream flows are typically lower and the dischargers have a greater influence on the water quality in the river, and alga growth is higher during the warmer temperatures of the summer months.

Chlorophyll a & Nutrients

When the WQMP is fully implemented, the model predicts chlorophyll a levels to drop substantially even when all the dischargers are at full capacity. The WQMP essentially reduces and places total nitrogen and total phosphorus loading caps on the significant dischargers. By removing these food sources for the algae, alga populations fall and thus, chlorophyll a levels are reduced.

Dissolved Oxygen

The model results show protection of the new dissolved oxygen criteria except for the month of May in several segments. At this time, staff does not feel any changes are necessary to the cBOD limits for the dischargers because:

1) The excursion is very small; 5.6 mg/L is the predicted concentration vs. a 6.0 mg/L minimum for the new criteria.
2) The model is not that accurate to warrant substantial changes to the STPs to achieve such a small difference in dissolved oxygen.
3) The model assumes May to be like July, August, and September, when in fact it is not, i.e., the water temperature is cooler and the background flows are higher.
4) The small violation does not warrant revamping the model.

To address this, staff will recommend increased ambient monitoring of the upper tidal Rappahannock River.

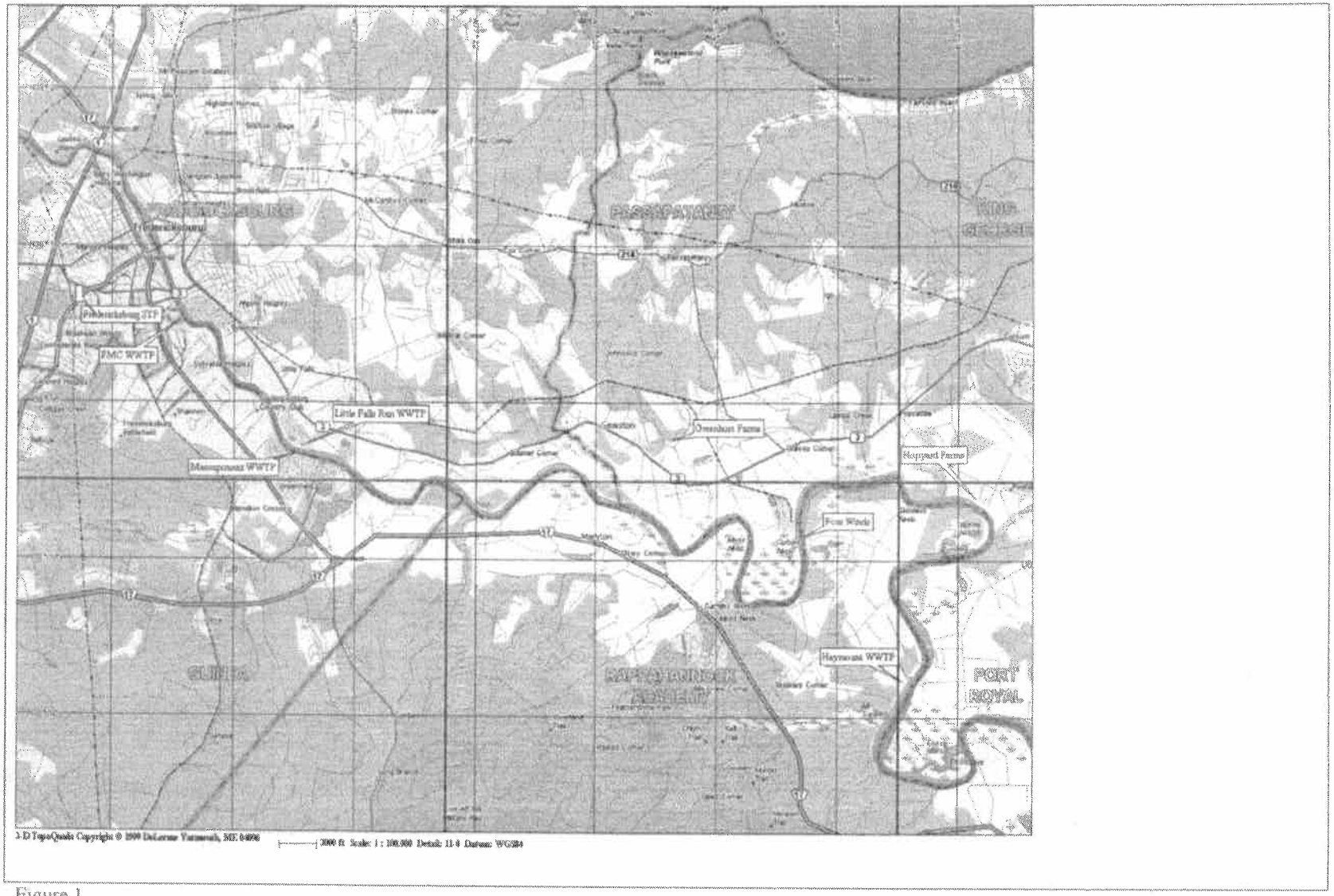


Figure 1
Discharger Locations

Table 1
VIMS Model Point Source Inputs

Summer (May – October)

	Segment 3	Segment 4	Segment 9	Segment 9	Segment 9	Segment 16	Segment 20	Segment 23	Segment 26
Tier	I	I	I	I	I	II	II	II	II
River Mile	108.64	107.37	104.67	104.61	Combined	96.39	92.2	89.8	85.10
Point Source	VA0025127	VA0068110	VA0025658	VA0076392	Total	VA0090654	VA0060429	VA0089338	VA89125
Q (flow m3/s) MGD x 0.0438	0.1971	0.2365	0.3504	0.5694	0.9198	0.0438	0.0092	0.0220	0.042
(N1) Organic Nitrogen (kg/d)	17.030	20.44	30.28	30.28	60.56	7.57	1.587	1.89	3.63
(N2) Ammonia (kg/d)	8.52	10.22	15.14	15.14	30.28	4.542	0.795	0.95	1.82
(N3) Nitrate + Nitrite (kg/d)	42.580	51.1	75.7	75.7	151.4	7.57	3.974	4.73	9.08
(P1) Organic Phosphorous (kg/d)	2.550	3.06	4.54	4.54	9.08	3.028	0.397	0.28	0.54
(P2) Inorganic Phosphorous (kg/d)	2.550	3.06	4.54	4.54	9.08	3.028	0.397	0.28	0.54
BOD/cBODu (Ultimate BOD_5) (kg/d)	553.76	766.46	757	1107.1	1864.1	37.85	59.64	118.281	36.3
DO (Dissolved Oxygen) (kg/d)	102.23	122.63	181.68	295.2	476.88	18.925	4.77	11.355	21.8

Winter (November – April)

	Segment 3	Segment 4	Segment 9	Segment 9	Segment 9	Segment 16	Segment 20	Segment 23	Segment 26
Tier	I	I	I	I	I	II	II	II	II
River Mile	108.64	107.37	104.67	104.61	Combined	96.39	92.2	89.8	85.10
Point Source	VA0025127	VA0068110	VA0025658	VA0076392	Total	VA0090654	VA0060429	VA0089338	VA89125
Q (flow m3/s) MGD x 0.0438	0.1971	0.2365	0.3504	0.5694	0.9198	0.0438	0.0092	0.0220	0.042
(N1) Organic Nitrogen (kg/d)	17.030	20.44	30.28	30.28	60.56	2.271	1.587	1.89	3.63
(N2) Ammonia (kg/d)	8.52	10.22	15.14	15.14	30.28	2.271	0.795	0.95	1.82
(N3) Nitrate + Nitrite (kg/d)	42.580	51.1	75.7	75.7	151.4	49.205	3.974	4.73	9.08
(P1) Organic Phosphorous (kg/d)	2.550	3.06	4.54	4.54	9.08	0.757	0.397	0.28	0.54
(P2) Inorganic Phosphorous (kg/d)	2.550	3.06	4.54	4.54	9.08	0.757	0.397	0.28	0.54
BOD/cBODu (Ultimate BOD_5) (kg/d)	553.76	766.46	757	1107.1	1864.1	37.85	59.64	118.281	36.3
DO (Dissolved Oxygen) (kg/d)	102.23	122.63	181.68	295.2	476.88	18.925	4.77	11.355	21.8

Notes on loadings:
VA0076392 – 8.0 MGD used for N1, N2, N3, P1, and P2. 13.0 MGD used for uBOD and DO.

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Facility = Massaponnax WWTF
Chemical = TRC
Chronic averaging period = 4
WLAa = 38
WLAc = 22
Q.L. = 100
# samples/mo. = 0
# samples/wk. = 0

Summary of Statistics:

observations = 1
Expected Value = 200
Variance = 14400
C.V. = 0.6
97th percentile daily values = 486.683
97th percentile 4 day average = 332.758
97th percentile 30 day average= 241.210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 32.1766452491711
Average Weekly limit = 19.1935325384021
Average Monthly LImit = 15.9474263677516

The data are:

200

Table 2
Current Model Associated Limits for All Dischargers in VIMS Model

Discharger Permit No.	Fredericksburg VA0025127	FMC VA0068110	Little Falls Run VA0076392	Massaponax VA0025658	Greenhost Farms VA0090654	Four Winds VA0060429	Hopyard Farm VA0089338	Haymount VA0089125
Segment	3	4	9	9	16	20	23	26
River Mile	108.64	107.37	104.61	104.67	96.39	92.2	89.8	85.10
Flow (MGD)	4.5	5.4	8.0	8.0	1.0	0.210	0.50	0.96
BOD5 (mg/L, kg/d)	N/A	N/A	N/A	N/A	NL	30/23.8	30/56.77	N/A
cBOD5 (mg/L, kg/d)	13.0 / 221	15.0 / 306.6	9.0 / 272	10.0 / 302.8	N/A	N/A	N/A	10.0 / 36
TKN (summer) (mg/L, kg/d)	7.0 /119.23	3.0 / 61.3	6.0 / 181.68	9.0 / 272.52	NL	2.29/1.82	N/A	3.0 / 10.9
TKN (winter) (mg/L, kg/d)	NL	N/A	NL	NL	NL	3.41/2.71	N/A	N/A
Ammonia (summer) (mg/L, kg/d)	N/A	N/A	NL	N/A	NL	N/A	10.7/20.2	N/A
Ammonia (winter) (mg/L, kg/d)	N/A	N/A	12.0 / 363.36	12.0 / 363.36	NL	N/A	12.4/23.4	N/A
Total Phosphorous (kg/d)	26.5	30.3	30.3	45.4	2.0 mg/L	1.59	3.78	7.3
Dissolved Oxygen (mg/L)	6.0	6.0	6.0	6.0	N/A	6.0	6.0	6.0

N/A – Not Applicable
NL – No Limit

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Facility = Massaponax WWTF
Chemical = Copper
Chronic averaging period = 4
WLAa = 14
WLAc = 9.9
Q.L. = 1.0
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 3.1
Variance = 3.4596
C.V. = 0.6
97th percentile daily values = 7.54359
97th percentile 4 day average = 5.15774
97th percentile 30 day average= 3.73876
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

3.1

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Facility = Massaponax WWTF
Chemical = Zinc
Chronic averaging period = 4
WLAa = 130
WLAc = 130
Q.L. = 20
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 48
Variance = 829.44
C.V. = 0.6
97th percentile daily values = 116.804
97th percentile 4 day average = 79.8619
97th percentile 30 day average= 57.8905
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

48

APPENDIX K – Industrial Waste Survey Form and Instructions

INSTRUCTIONS FOR DISCHARGER SURVEY FORM

General

1. This form is to be completed by industrial/commercial dischargers to Publicly Owned Treatment Works.

2. Complete all questions applicable to the discharge. Indicate NA for those questions not applicable.

3. If space provided on the form is not sufficient, attach sheet noting the question number and complete the answer.

Specific Title

The name and address of the facility, including the name of the owner and operator shall be submitted.

PART A - DISCHARGE INFORMATION

A-1 List all environmental permits held by or for the facility.

A-2 If yes, complete the remainder of the form and return to the Control Authority promptly. If no, complete questions A-3, A-4, A-5,A-6, B-l, and B-2 for identification purposes only and return to the Control Authority. A "No" answer would be applicable to dischargers with no wastewater discharge at all or discharging only sanitary waste.

PART B - ACTIVITY INFORMATION

B-1 Indicate the nature of the business conducted on the premises.

B-2 Standard industrial classification (SIC) numbers and descriptions may be found in the 1987 edition of the Standard Industrial Classification Manual prepared by the Executive Office of the President, Office of Management and Budget. This is available at most public libraries. The four-digit industrial SIC number shall be provided to identify the activity actually causing the discharge.

For each SIC number listed, the principal product or service shall be provided.

B-3 Description of Operations. The user shall submit a brief description of the nature of the operations carried out by the surveyed facility. Include the date the facility was established on the present site.

Provide a separate narrative description of each specific activity or process producing a discharge to the municipal or public sewerage system or treatment works. Descriptions should be as concise as possible. Example: "Manufacture of sulfuric acid by contact process."

B-4 Provide in this space a brief narrative description of any pretreatment the wastewater receives prior to discharge. Include in this description those process changes, recycling methods, wastewater treatment equipment, and other techniques employed that result in waste abatement of this discharge.

B-5 Flow measurements shall show the measured average daily and maximum daily flow in gallons per day to the POTW from regulated process streams and from other streams as necessary to account for the sources of all wastewaters discharged to the sewer system.

PART C -Industrial Waste(s) and Other Waste(s) Discharged

C-1 List each wastestream discharged to the treatment works under the description column whether it is process water, cooling water, sanitary wastewater or a combination of these. For process water discharges indicate the industrial process which results in the discharge (by SIC number or brief description).

For sanitary waste discharges only. Provide the information called for in Section C-2. However, Sections C-3, C-4, C-5 and C-6 need not be completed for discharges consisting only of sanitary wastewater.

C-2 Type of Discharge

(a) For discharges originating from regulated processes, identify the pretreatment standards applicable to each.

(b) A continuous discharge is one which occurs without interruption throughout the operating hours of the facility. An intermittent discharge is a discharge that occurs and ceases at regular or irregular intervals.

(c) Discharge Points - Indicate for each wastestream discharged whether the wastestream is discharged into one of the following:

1. Sanitary Wastewater Transport System - (A system of pipes conveying domestic wastewaters with storm and runoff waters excluded.)

2. Combined Sanitary and Stormwater Transport System - (A system of pipes which carries a mixture of storm water runoff, surface water runoff, and other wastewaters such as domestic, commercial or industrial wastewaters.)

3. Storm Water Transport System -(A separate collection system that conveys runoff from buildings, street surfaces and land resulting from precipitation.)

4. Other - (Specify)

(d) Discharge Occurrence - For each waste discharge indicate the days of the week the discharge(s) occurs. If the discharge(s) normally operate (either intermittently, or continuously) on less than a year-round basis, (excluding shutdowns for routine maintenance) name the months of the year discharge is operating. If discharge operates full year, indicate "12 months" next to appropriate waste discharge number(s).

(e) Average Flows for Intermittent Discharge(s) and

(f) Average Flows for Continuous Discharges(s) - When actual flow measurement data is available, provide data which best represents the average discharge rate. Also, provide the maximum discharge rate observed. In the absence of any flow measurements, estimates of the average discharge rate may be provided. Some methods of flow estimation would be: 1) water meter readings on incoming lines minus water losses through plant; 2) pumping rates if discharge must be pumped to the sewer; or 3) for batch operations, measurement of the change in the level of the batch reservoir with time.

Indicate where appropriate whether information for discharge rates is estimated or the result of actual measurement. Also, in the space provided on the form describe the methods used to obtain the discharge rate information. If a waste discharge number describes a combined significant

discharger and sanitary discharge, then indicate next to the flow figures provided the percentage of that discharge which is attributed to the sanitary portion.

C-3 Presence and Results of metals and GC/MS Analysis of Table 1 Substances

C-4 Presence of Table 1 and Table 2 Substances

Analysis results must be presented for any Table 1 substance for which the discharger is regulated through a categorical or local pretreatment limit. Apart from this, presence or absence of a substance should be based on any previous analysis performed or based on knowledge of the constituents associated with the activities and/or processes causing the discharge (e.g., raw materials, catalysts, intermediates, etc.). For example, if zinc is used in a process from which there is a discharge, the waste discharge point number for that discharge would be written in the box next to zinc unless it is known that zinc is not present in the discharge. This claim should be based upon either actual analysis previously conducted or a mass balance established around that process in which zinc is used.

Any duplication in the listing of substances in the tables is due to the fact that they were previously published by others. Indication of the presence of one of these substances need not be repeated in multiple tables.

C-5 Presence of Table III Wastewater Characteristics

Same instructions as provided for Sections C-3 and C-4. Note that pH is indicated as present in all cases.

C-6 Sampling and Analysis

The discharger shall submit the results of sampling and analysis identifying the nature and concentration, or mass, of regulated pollutants in the discharge from each regulated process. Both daily maximum and average concentrations, or mass, where required shall be reported. The sample shall be representative of daily operations.

A minimum of four(4) grab samples must be used for pH, cyanide, total phenol, oil and grease, sulfide, and volatile organics. For all other pollutants, 24-hour composite samples must be obtained through flow- proportioned techniques where feasible. If not feasible, samples may be obtained through time-proportional composite sampling techniques or through a minimum of four (4) grab samples where the user demonstrates this will provide a representative sample of the effluent. A minimum of one (1) representative sample is required.

Samples shall be taken immediately downstream from pretreatment facilities if such exist or immediately downstream from the regulated process if no pretreatment exists. If other wastewaters are mixed with regulated waste-waters prior to pretreatment, the user should measure the flows and concentrations necessary to allow use of the combined wastestream formula in order to evaluate compliance with the pretreatment standards. When an alternate concentration or mass limit has been calculated in accordance with the combined wastestream formula, this adjusted limit along with supporting data shall be submitted to the Control Authority.

Sampling and analysis procedures shall be performed in accordance with the techniques prescribed in 40 CFR 136 (1991). When 40 CFR Part 136 does not contain sampling or analytical techniques for the pollutant in question, or when the Director determines that the Part 136 sampling and analytical techniques are inappropriate for the pollutant in question, sampling and analysis shall be performed by using validated analytical methods or any other applicable sampling and analytical procedures, including procedures suggested by the POTW or other parties, approved by the EPA.

DISCHARGER SURVEY FORM VWCB PERMIT REGULATION PART VII

SURVEY OF DISCHARGES TO THE PUBLICLY OWNED PRETREATMENT WORKS (POTW)

NOTE: Refer to attached instructions when answering questions below.

TITLE:

A. Discharge Information

A-1 Permits held _____

A-2 Does this establishment discharge industrial waste (1) or other waste(s); (2) to the POTW? Please check below:

Yes_____ No_____

A-3 Name of facility discharging wastes to the POTW:

_____

Name of owner of the facility _____

Name of operator of the facility _____

A-4 Address of the facility _____

Address of the Owner _____

Address of the Operator _____

A-5 Telephone number of facility _____

Telephone number of owner _____

Telephone number of operator _____

A-6 Name and telephone number of person completing this form:

_____

(1) "Industrial Waste" means liquid or other wastes resulting from any process of industry, manufacture, trade or business, or from the development of any natural resources.

(2) "Other waste" means decayed wood, sawdust, shavings, bark, lime, garbage, refuse, ashes, offals, tar, oil, chemicals, and all other substances, except industrial waste and sewage, which may cause pollution in any waters.

B. Activity Information

B-1 Type of industry, manufacture, trade or business:

_____

B-2 Standard Industrial Classification Code, (available from Standard Industrial Classification Manual), principal product or service and average rate of production.

SIC Code

Provide Four-Digit Industrial Code	Product or Service Provided	Average Rate of Production (Monthly-Weekly-Daily)

_____ _____ _____
_____ _____ _____
_____ _____ _____

B-3 General description of industrial/trade activities and/or plant processes on the premises: Include the date established on site.

_____
_____
_____

B-4 Describe any waste handling and/or pretreatment facilities:

_____
_____
_____

B-5 Flow measurements of each discharge:

SIC Code	Activity	Daily Flow (Gallons/Day) Average	Maximum
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

C. Industrial Waste(s) and Other Waste(s) Discharged

C-1

Industrial Processes	Description	Waste Discharge Number
_____	_____	_____
_____	_____	_____
_____	_____	_____

C-2 a.

Regulated Process	Categorical Pretreatment Standard
_____	_____
_____	_____
_____	_____

b. Type of Discharge ____Continuous _____Intermittent

c. Discharge Point Description

Discharge Points SIC Code	(Describe Receiving Systems)
_____	_____
_____	_____

d. Discharge Occurrence

SIC Code	Days Per Week (Circle)	Months

_____ S M T W T F S _____
_____ S M T W T F S _____
_____ S M T W T F S _____

e. Average flows for Intermittent Discharges

Waste Discharge Number	FREQUENCY (Avg No. of Discharge Occurrences Per Day)	DURATION (Avg No. of Hrs Per Day Discharge is Operating)	DISCHARGE QUANTITY (Avg Volume Per Day Discharged-Gal)	Estimate(E) or Measurement(M)

f. Average flows for Continuous Discharges

Waste Discharge Number	DURATION (Average number of hours per day the discharge is operating)	Average Daily Flow (GPD)	Maximum Daily Flow (GPD)	Estimate (E) or Measurement(M)

Describe the methods used for flow measurement and/or flow estimation in C-2.(e) and C-2.(f) above:

C-3 Presence of Toxic Substances - TABLE 1

Indicate by waste discharge number(s) beside each substance if it is present in the discharge(s) to the sewerage system or treatment works.

Parameter	ug/l	Parameter	ug/l	Parameter	ug/l
Acenaphthene		Acenaphthylene		Acrolein	
Acrylonitrile		Aldrin		Alpha-endosulfan	
Alpha-BHC		Aluminum, total		Anthracene	
Antimony, total		Arsenic, total		Asbestos	
Barium		Benzene		Beta-endosulfan	
Benzidine		Benzo(a) anthracene		Benzo(b) pyrene	
3,5-benzoflouranthene		Benzo(ghi) perylene M-Cresol		Benzo(k) flouranthene	
Beryllium, total		Beta - BHC		Bis(2-chloroethoxy) methane	
Bis(2-chloroethyl) ether		Bis(2-chloroisopropyl) ether		Bis(2-ethylhexyl) phthalate	
Boron		Bromide		Bromoform	
4-bromophenyl phenyl ether		Butylbenzyl phthalate		Cadmium	
Carbon tetrachloride		Chlordane		Chlorine, total residual	
Chlorobenzene		Chlorodibromomethan		Chloroethane	

		e			
2-Chloronaphthalene		2-Chlorophenol		p-Chloro-m-cresol	
4-Chlorophenyl phenyl ether		2-Chloroethyl vinyl ether		Chloroform	
Chromium, total Color		Chrysene Copper, total		Cobalt, total	
1,3 - Cis-dichloropropylene		Cyanide, total		Dibenzo(a,b) anthracene	
Delta - BHC		4,4 - DDT		4,4 - DDE	
4,4 - DDD		Dieldrin		1,2- Dichlorobenzene	
1,3 - Dichlorobenzene		1,4 - Dichlorobenzene		3,3 - Dichlorobenzidine	
Dichlorobromomethane		1,1 - Dichloroethane		1,2 - Dichloroethane	
1,1 - Dichloroethylene		2,4 - Dichlorophenoll,2 -		Dichloropropane	
1,2 - Dichloropropylene		Diethyl Phthalate		Dimethyl Phthalate	
2,4 - Dimethylphenol Di-N-butyl phthalate		Di-N-butyl Phthalate		2,4 - Dinitrotoluene	
2,6 - Dinitrotoluene		Di-N-octyl phthalate		1,2 - Diphenylhydrazine	
Endosulfan sulfate		Endrin		Endrin aldehyde	
Ethylbenzene		Fecal coliform		Fluoranthene	
Fluorine		Fluoride		Gamma - BHC	
Heptachlor		Heptachlor epoxide		Hexachlorobenzene	
Hexachlorobutadiene		Hexachlorocyclopentadiene		Hexachloroethane	
Indeno (1,2,3 - cd) pyrene		Isophorone		Iron, total	
Lead, total		Manganese, total		Magnesium, total	
Mercury, total		Methyl Bromide		Methyl chloride	
Methylene chloride					
Molybdenum, total		Naphthalene		Nitrobenzene	
N-nitrosodimethylamine		N-nitrosodi-N-propylamine		N-nitrosodiphenylamine	
Nickel, total		Nitrate - Nitrite		Nitrogen, total organic	
2 - Nitrophenol		4 - nitrophenol		Oil and Grease	
PCB - 1016		PCB - 1221		PCB - 1232	
PCB - 1242		PCB - 1248		PCB - 1254	
PCB - 1260		Pentachlorophenol		Phenol	
Phenols, total		Phenanthrene		Phosphorus, total	

Pyrene		Radioactivity		Selenium, total	
Silver, total		Sulfate		Sulfide	
Sulfite		Surfactants		1,1,2,2,- Tetrachloroethane	
Thallium, total		Tin,		Titanium, total	
Toluene		Toxaphene		1,2,4 - trichlorobenzene	
Toluene		1,2 - trans- dichloroethylene		1,2 - trans- dichloropropylene	
1,1,1, - trichloroethane		1,1,2 - trichloroethane		Trichloroethylene 2,4,6 -	
trichlorophenol		Vinyl chloride		Zinc, total	

C-4 Presence of Table 2 Substances (Hazardous)

Indicate by circling name whether substance is present in the discharge(s) to sewerage systems or treatment works. Also indicate waste discharge number beside circled substances.

Acetaldehyde		Allyl alcohol		Allyl chloride	
Amyl acetate		Aniline		Benzonitrile	
Benzyl chloride		Butyl acetate		Butylamine	
Captan		Carbaryl		Carbofuran	
Carbon disulfide		Chlorpyrifos		Coumaphos	
Cresol		Crotonaldehyde		Cyclohexane	
2,4-D (2,4-Dichlorophenoxy acetic acid)		Diazinon		Dicamba	
Dichlobenil		Dichlone		2,2-Dichloropropionic Acid	
Dichlorvos		Diethylamine		Dimethylamine	
Dinitrobenzene		Diquat		Disulfoton	
Diuron		Epichlorohydrin		Ethanolamine	
Ethion		Ethylenediamine		Ethlyenedibromide	
Formaldehyde		Furfural		Guthion	
Isoprene		Isopropanolamine dodecylbenzenesulfanate		Kelthane	
Kepone		Malathion		Mercaptodimethur	
Methoxychlor		Methylmercaptan		Methylmethacrylate	
Methylparathion		Mevinphos		Mexacarbate	
Monoethylamine		Monomethylamine		Naled	
Napthenic acid		Nitrotoluene		Parathion	
Phenolsulfanate		Phosgene		Propargite	
Propylene oxide		Pyrethrins		Quinoline	
Resorcinol		Strontium		Strychnine	
Styrene		2,4,5-T (2,4,5-Trichlorophenoxy acetic acid)		TDE (Tetrachlorodyphenylethane)	
2,4,5-TP [2-(2,4,5 Trichlorophenoxy)(propanoic acid]		Trichlorofan		Triethylamine	
Trimethylamine		Uranium		VanadiumXylene	
Xylenol		Zirconium		Other *	

*Material listed in 40 CFR Part ll6 (Designation of Hazardous Substances) known to be present.

C-5 Wastewater Presence of Table III Characteristics

Indicate by waste discharge number in the box beside each parameter whether it is present in the discharge(s) to sewerage systems or treatment works.

Parameter	mg/l	Parameter	Mg/l	Parameter	mg/l
1. Algicides*		2. Ammonia		3. Biochemical Oxygen Demand (BOD 5)	
4. Calcium		5. Chemical Oxygen Demand (COD)		6. Chloride	
7. Dyes (organic)*		8. Dyes (inorganic)*		9. Flammable liquids	
10. High temperature (80 degrees F)		11. Organic Nitrogen		12. pH (standard units)	
13. Potassium		14. Sodium		15. Total Suspended Solids	
16. Turbidity (Jackson Units)		17. Others**			

*Specify substance or compound, in space provided below, where possible trade names should be accompanied by a listing of chemical constitutents.

_____

_____

_____

**Other waste substances _____

_____

_____

C-6 Sampling and Analysis

Wastewater Pollutant	Process Where Pollutant Generated	Average* Concentration or Mass**	Maximum Concentration or Mass	Flow	Sample Type	Number of Samples Composited	Location of Sample	Sampling Technique

DISCHARGER SURVEY SHORT FORM

FOR THE _____ POTW

1. Company name: _____

   Mailing address: _____

   _____

   Telephone #:_____ E-Mail:_____

   Facility address (if different from above):_____

2. Authorized representative for official interactions/contact with Publicly Owned Treatment Works (POTW) or local jurisdiction

   Name: _____ Title:

   Telephone: _____ E-Mail:

3. Type of business conducted (auto repair, machine shop, electroplating, warehousing, painting, printing, meat packing, food processing, etc.):

4. Standard Industrial Classification (SIC) Code: _____ NAICS:

5. Environmental-related permits held for this facility/location:

6. Type(s) of wastewater discharged by facility: (Please □ and indicate the flow, i.e., typical gallons discharged per day, and the frequency of the discharge, i.e., batch, intermittent, or continuous.)

	Flow (gpd)	Frequency
a. ( ) Domestic waste (restrooms, employees showers, etc.	_____	
b. ( ) Cooling water, non-contact	_____	
c. ( ) Boiler/Tower blowdown	_____	
d. ( ) Cooling water, contact	_____	
e. ( ) Process	_____	
f. ( ) Equipment/Facility washdown	_____	
g. ( ) Air pollution control unit	_____	
h. ( ) Storm water runoff to sewer	_____	
i. ( ) Other (describe)	_____	

7. Type of wastewater treatment, if any, prior to discharging to sewer:

8. Days and hours of facility operation:

   Days when discharges occur:

_____

Signature Title Date

_____

Print Name

**Please note that if further survey information is necessary, additional forms will be sent to you for completion.*

BIOMONITORING RESULTS
Massaponax Wastewater Treatment Facility (VA0025658)

Table 1. Summary of Toxicity Test Results for Outfall 001.

TEST DATE	TEST TYPE/ORGANISM	48-h LC_{50} (%)	NOAEC /NOEC (%)	% SURV	IC_{25} (%)	TUa NOAEC	TUc	REMARKS
02/14/96	Acute *C. dubia*	18.3		0				1st Annual
02/13/96	Chronic *P. promelas*		50 SG	0				
05/30/96	Acute *C. dubia*	>100		100				retest
05/28/96	Chronic *P. promelas*		100 SG	98				
01/22/97	Acute *C. dubia*	>100		95				2nd Annual
01/21/97	Chronic *P. promelas*		100 S 50 G	93				
02/25/98	Acute *C. dubia*	>100		55				3rd Annual
02/23/98	Chronic *P. promelas*		100 S 57.5 G	90				
02/03/99	Acute *C. dubia*	20.3		0				4th Annual
02/01/99	Chronic *P. promelas*		57.5 S 15 G	48				
04/28/99	Acute *C. dubia*	>100		100				retest
02/23/00	Acute *C. dubia*	>100		85				5th Annual
02/22/00	Chronic *P. promelas*		15 SG	0				
02/21/01	Acute *C. dubia*	>100		100				6th annual
02/19/01	Chronic *P. promelas*	77.1	57.5 S 15 G	0	47.1			
	Permit Reissued October 4, 2001							
11/28/01	Acute *C. dubia*	>100	100	100		1		1st Annual
11/28/01	Acute *P. promelas*	73.8	50	15		2		37 mg/L NH3-N
11/26/01	chronic *C. dubia*	>100	100 S 67.5 R	90	52.6		1.48	
11/26/01	Chronic *P. promelas*	>100	**35 SG**	5	43.1		**2.85**	
04/10/02	Acute *C. dubia*	85.2	50	35		2		2nd Annual
04/10/02	Acute *P. promelas*	66	50	0		2		NH3-N = 22 mg/L
04/08/02	chronic *C. dubia*	>100	**35 SR**	0	43.2		**2.85**	
04/08/02	Chronic *P. promelas*	>100	**35 SG**	0	47.6		**2.85**	
04/09/03	Acute *C. dubia*	>100	100	95		1		1st quarterly
04/09/03	Acute *P. promelas*	>100	100	100		1		
04/07/03	chronic *C. dubia*	>100	100 SR	100	>100		1	
04/07/03	Chronic *P. promelas*	>100	100 SG	100	>100		1	
08/13/03	Acute *C. dubia*	>100	100	100		1		2nd quarterly
08/13/03	Acute *P. promelas*	>100	100	100		1		
08/11/03	chronic *C. dubia*	>100	100 SR	90	>100		1	
08/11/03	Chronic *P. promelas*	>100	100 SG	90	>100		1	
11/12/03	Acute *C. dubia*	>100	100	100		1		3rd quarterly
11/12/03	Acute *P. promelas*	>100	100	100		1		
11/10/03	chronic *C. dubia*	>100	100 SR	100	>100		1	

TEST DATE	TEST TYPE/ORGANISM	48-h LC_{50} (%)	NOAEC /NOEC (%)	% SURV	IC_{25} (%)	TUa NOAEC	TUc	REMARKS
11/10/03	Chronic *P. promelas*	>100	100 S **35 G**	95	43.9		**2.85**	
01/12/04	Acute *C. dubia*	>100	100	100		1		4th quarterly
01/12/04	Acute *P. promelas*	>100	100	100		1		
01/09/04	chronic *C. dubia*	>100	100 SR	90	>100		1	
01/09/04	Chronic *P. promelas*	>100	100 S 67.5 G	85	>100		1.48	
04/14/04	Acute *C. dubia*	**35.4**	**25**	**0**		**4**		5th quarterly
04/14/04	Acute *P. promelas*	>100	100	100		1		(Rec'd 10/12)
04/12/04	chronic *C. dubia*	>100	**17.5 SR**	**0**	37.1		**5.71**	
04/12/04	Chronic *P. promelas*	>100	100 S **35 G**	90	55.3		**2.85**	
07/21/04	Acute *C. dubia*	>100	100	100		1		6th quarterly
07/21/04	Acute *P. promelas*	>100	100	100		1		(rec'd 9/13)
07/19/04	chronic *C. dubia*	>100	100 SR	90	>100		1	
07/19/04	Chronic *P. promelas*	>100	100 S **35 G**	80	85.6		**2.85**	
10/25/04	Acute *C. dubia*	>100	100	100		1		7th quarterly
10/25/04	Acute *P. promelas*	>100	100	100		1		
10/20/04	chronic *C. dubia*	>100	100 SR	90	>100		1	
10/20/04	Chronic *P. promelas*	>100	67.5 SG	85	>100		1.48	
03/09/05	Acute *C. dubia*	>100	100	100		1		8th quarterly
03/11/05	Acute *P. promelas*	>100	100	100		1		
03/07/05	chronic *C. dubia*	>100	100 SR	90	95		1	NH3-N = 5 mg/L
03/07/05	Chronic *P. promelas*	>100	100 SG	95	>100		1	
06/22/05	Acute *C. dubia*	>100	100	100		1		9th quarterly
06/22/05	Acute *P. promelas*	>100	100	100		1		
06/20/05	chronic *C. dubia*	>100	100 SR	100	>100		1	
06/20/05	Chronic *P. promelas*	>100	100 SG	98	>100		1	
*08/17/05	Acute *C. dubia*	>100	100	100		1		10th quarterly
*08/17/05	Acute *P. promelas*	>100	100	100		1		
*08/16/05	chronic *C. dubia*	>100	100 SR	100	>100		1	
*08/16/05	Chronic *P. promelas*	>100	100 SG	90	>100		1	

FOOTNOTES:

* Test included in the current data review.

A **bold** faced value for LC_{50} or NOEC indicates that the test failed the criteria.

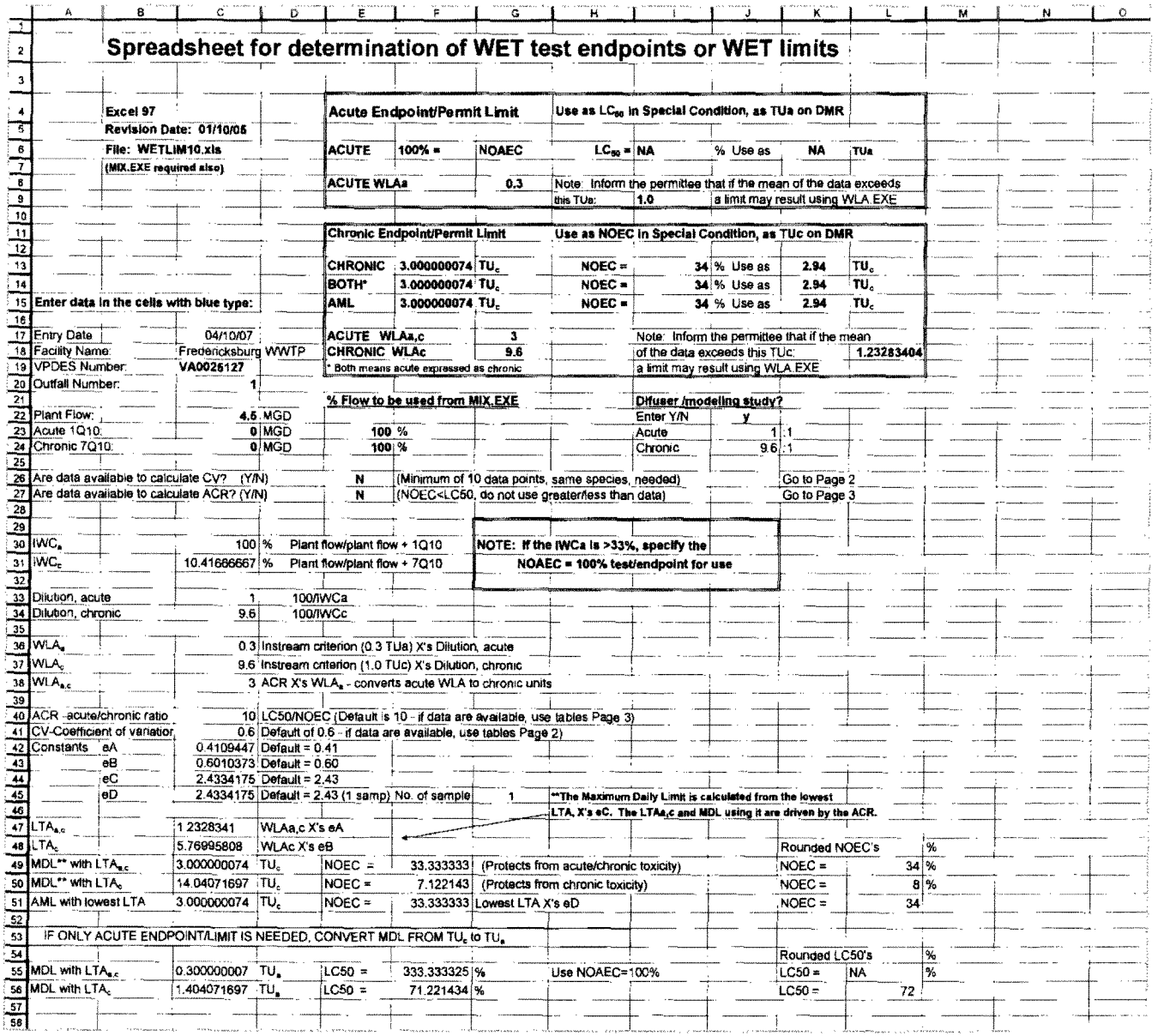
ABBREVIATIONS:

S - Survival; G - Growth

% SURV - Percent survival in 100% effluent

NOAEC – No observed adverse effect concentration for acute tests

NOEC – No observed effect concentration for chronic tests



Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 01/10/06
File: WETLIM10.xls
(MIX.EXE required also)

Acute Endpoint/Permit Limit — **Use as LC_{50} in Special Condition, as TUa on DMR**

ACUTE	100% =	NOAEC	LC_{50} = NA	% Use as	NA	TUa

ACUTE WLAa 0.3

Note: Inform the permittee that if the mean of the data exceeds this TUa: 1.0 a limit may result using WLA.EXE

Chronic Endpoint/Permit Limit — **Use as NOEC in Special Condition, as TUc on DMR**

CHRONIC	3.000000074	TU_c	NOEC =	34	% Use as	2.94	TU_c
BOTH*	3.000000074	TU_c	NOEC =	34	% Use as	2.94	TU_c
AML	3.000000074	TU_c	NOEC =	34	% Use as	2.94	TU_c

ACUTE WLAa,c 3
CHRONIC WLAc 9.6
* Both means acute expressed as chronic

Note: Inform the permittee that if the mean of the data exceeds this TUc: 1.23283404 a limit may result using WLA.EXE

Enter data in the cells with blue type:

Entry Date	04/10/07		
Facility Name:	Fredericksburg WWTP		
VPDES Number:	VA0026127		
Outfall Number:	1		
Plant Flow:	4.5	MGD	
Acute 1Q10:	0	MGD	100 %
Chronic 7Q10:	0	MGD	100 %

% Flow to be used from MIX.EXE

Difuser /modeling study?
Enter Y/N y
Acute 1 :1
Chronic 9.6 :1

Are data available to calculate CV? (Y/N) N (Minimum of 10 data points, same species, needed) Go to Page 2
Are data available to calculate ACR? (Y/N) N (NOEC<LC50, do not use greater/less than data) Go to Page 3

IWC_a	100	%	Plant flow/plant flow + 1Q10
IWC_c	10.41666667	%	Plant flow/plant flow + 7Q10
Dilution, acute	1		100/IWCa
Dilution, chronic	9.6		100/IWCc
WLA_a	0.3		Instream criterion (0.3 TUa) X's Dilution, acute
WLA_c	9.6		Instream criterion (1.0 TUc) X's Dilution, chronic
$WLA_{a,c}$	3		ACR X's WLA_a - converts acute WLA to chronic units
ACR -acute/chronic ratio	10		LC50/NOEC (Default is 10 - if data are available, use tables Page 3)
CV-Coefficient of variation	0.6		Default of 0.6 - if data are available, use tables Page 2)
Constants eA	0.4109447		Default = 0.41
eB	0.6010373		Default = 0.60
eC	2.4334175		Default = 2.43
eD	2.4334175		Default = 2.43 (1 samp) No. of sample 1

NOTE: If the IWCa is >33%, specify the NOAEC = 100% test/endpoint for use

**The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The $LTA_{a,c}$ and MDL using it are driven by the ACR.

$LTA_{a,c}$	1.2328341	WLAa,c X's eA						
LTA_c	5.76995808	WLAc X's eB					Rounded NOEC's	%
MDL** with $LTA_{a,c}$	3.000000074	TU_c	NOEC =	33.333333	(Protects from acute/chronic toxicity)		NOEC =	34 %
MDL** with LTA_c	14.04071697	TU_c	NOEC =	7.122143	(Protects from chronic toxicity)		NOEC =	8 %
AML with lowest LTA	3.000000074	TU_c	NOEC =	33.333333	Lowest LTA X's eD		NOEC =	34

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

							Rounded LC50's	%
MDL with $LTA_{a,c}$	0.300000007	TU_a	LC50 =	333.333325	%	Use NOAEC=100%	LC50 = NA	%
MDL with LTA_c	1.404071697	TU_a	LC50 =	71.221434	%		LC50 = 72	

Attachment 15

PUBLIC NOTICE OF INTENT TO REISSUE A VPDES PERMIT

Citizens may comment on the proposed permit reissuance that allows the release of treated wastewater into a water body in Spotsylvania County, Virginia

PUBLIC COMMENT PERIOD: July 21, 2007 to 5:00 p.m. on August 19, 2007

PERMIT NAME: Massaponax Wastewater Treatment Facility (WWTF)
Virginia Pollutant Discharge Elimination System Permit (VPDES)
Owners or operators of municipal facilities that discharge or propose to discharge wastewater into the streams, rivers or bays of Virginia from a point source must apply for this permit. In general, point sources are fixed sources of pollution such as pipes, ditches or channels. The applicant must submit the application to the Department of Environmental Quality, under the authority of the State Water Control Board.

PURPOSE OF NOTICE: To invite the public to comment on the draft permit.

NAME, ADDRESS AND PERMIT NUMBER OF APPLICANT: Spotsylvania County
600 Hudgins Road
Fredericksburg, VA 22408
VA0025658

NAME AND ADDRESS OF FACILITY: Massaponax WWTF
10900 Hudgins Road
Fredericksburg, VA 22408

PROJECT DESCRIPTION: Spotsylvania County has applied for reissuance of a permit for the Massaponax WWTF in Spotsylvania County, Virginia. The applicant proposes to release treated sewage at a rate of 8.0 Million Gallons per Day into the Rappahannock River in Spotsylvania County that is in the Rappahannock River Watershed. A watershed is the land area drained by a river and its incoming streams. The sludge will be composted or landfilled. The permit will limit or monitor the following pollutants to amounts that protect water quality: Flow, pH, CBOD, Total Suspended Solids, Total Phosphorus, *E. Coli* bacteria, Dissolved Oxygen, Total Nitrogen, Total Kjeldahl Nitrogen, Ammonia as Nitrogen, Nitrite and Nitrate as Nitrogen, and Total Residual Chlorine. The facility is subject to the requirements of 9 VAC 25-820 and has registered for coverage under the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia.

HOW A DECISION IS MADE: After public comments have been considered and addressed by the permit or other means, DEQ will make the final decision unless there is a public hearing. DEQ may hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the proposed permit. If there is a public hearing, the State Water Control Board will make the final decision.

HOW TO COMMENT: DEQ accepts comments by e-mail, fax or postal mail. All comments must be in writing and be received by DEQ during the 30 day comment period. The public also may request a public hearing.

WRITTEN COMMENTS MUST INCLUDE:
1. The names, mailing addresses and telephone numbers of the person commenting and of all people represented by the citizen.
2. If a public hearing is requested, the reason for holding a hearing, including associated concerns.
3. A brief, informal statement regarding the extent of the interest of the person commenting, including how the operation of the facility or activity affects the citizen.

TO REVIEW THE DRAFT PERMIT AND APPLICATION: The public may review the documents at the DEQ-Northern Virginia Regional Office every work day by appointment.

CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION:
Name: Anna T. Westernik
Address: DEQ-Northern Virginia Regional Office, 13901 Crown Court, Woodbridge, VA 22193
Phone: (703) 583-3837 E-mail: atwesternik@deq.virginia.gov Fax: (703) 583-3841

Attachment 16

Revised 2/2003

State "Transmittal Checklist" to Assist in Targeting
Municipal and Industrial Individual NPDES Draft Permits for Review

Part I. State Draft Permit Submission Checklist

In accordance with the MOA established between the Commonwealth of Virginia and the United States Environmental Protection Agency, Region III, the Commonwealth submits the following draft National Pollutant Discharge Elimination System (NPDES) permit for Agency review and concurrence.

Facility Name:	Massaponax WWTF
NPDES Permit Number:	VA0025658
Permit Writer Name:	Anna T. Westernik
Date:	May 16, 2007

Major [X] **Minor** [ ] **Industrial** [ ] **Municipal** [X]

I.A. Draft Permit Package Submittal Includes:	**Yes**	**No**	**N/A**
1. Permit Application?	X		
2. Complete Draft Permit (for renewal or first time permit – entire permit, including boilerplate information)?	X		
3. Copy of Public Notice?	X		
4. Complete Fact Sheet?	X		
5. A Priority Pollutant Screening to determine parameters of concern?	X		
6. A Reasonable Potential analysis showing calculated WQBELs?	X		
7. Dissolved Oxygen calculations?	X		
8. Whole Effluent Toxicity Test summary and analysis?	X		
9. Permit Rating Sheet for new or modified industrial facilities?			X

I.B. Permit/Facility Characteristics	**Yes**	**No**	**N/A**
1. Is this a new, or currently unpermitted facility?		X	
2. Are all permissible outfalls (including combined sewer overflow points, non-process water and storm water) from the facility properly identified and authorized in the permit?	X		
3. Does the fact sheet **or** permit contain a description of the wastewater treatment process?	X		
4. Does the review of PCS/DMR data for at least the last 3 years indicate significant non-compliance with the existing permit?		X	
5. Has there been any change in streamflow characteristics since the last permit was developed?		X	
6. Does the permit allow the discharge of new or increased loadings of any pollutants?		X	
7. Does the fact sheet **or** permit provide a description of the receiving water body(s) to which the facility discharges, including information on low/critical flow conditions and designated/existing uses?	X		
8. Does the facility discharge to a 303(d) listed water?	X		
a. Has a TMDL been developed and approved by EPA for the impaired water?		X	
b. Does the record indicate that the TMDL development is on the State priority list and will most likely be developed within the life of the permit?	X		
c. Does the facility discharge a pollutant of concern identified in the TMDL or 303(d) listed water?	X		
9. Have any limits been removed, or are any limits less stringent, than those in the current permit?		X	
10. Does the permit authorize discharges of storm water?		X	

Attachment 17

I.B. Permit/Facility Characteristics – cont.	Yes	No	N/A
11. Has the facility substantially enlarged or altered its operation or substantially increased its flow or production?		X	
12. Are there any production-based, technology-based effluent limits in the permit?		X	
13. Do any water quality-based effluent limit calculations differ from the State's standard policies or procedures?		X	
14. Are any WQBELs based on an interpretation of narrative criteria?		X	
15. Does the permit incorporate any variances or other exceptions to the State's standards or regulations?		X	
16. Does the permit contain a compliance schedule for any limit or condition?		X	
17. Is there a potential impact to endangered/threatened species or their habitat by the facility's discharge(s)?		X	
18. Have impacts from the discharge(s) at downstream potable water supplies been evaluated?	X		
19. Is there any indication that there is significant public interest in the permit action proposed for this facility?		X	
20. Have previous permit, application, and fact sheet been examined?	X		

Part II. NPDES Draft Permit Checklist

Region III NPDES Permit Quality Checklist – for POTWs

(To be completed and included in the record only for POTWs)

II.A. Permit Cover Page/Administration	Yes	No	N/A
1. Does the fact sheet or permit describe the physical location of the facility, including latitude and longitude (not necessarily on permit cover page)?	X		
2. Does the permit contain specific authorization-to-discharge information (from where to where, by whom)?	X		

II.B. Effluent Limits – General Elements	Yes	No	N/A
1. Does the fact sheet describe the basis of final limits in the permit (e.g., that a comparison of technology and water quality-based limits was performed, and the most stringent limit selected)?	X		
2. Does the fact sheet discuss whether "antibacksliding" provisions were met for any limits that are less stringent than those in the previous NPDES permit?	X		

II.C. Technology-Based Effluent Limits (POTWs)	Yes	No	N/A
1. Does the permit contain numeric limits for ALL of the following: BOD (or alternative, e.g., CBOD, COD, TOC), TSS, and pH?	X		
2. Does the permit require at least 85% removal for BOD (or BOD alternative) and TSS (or 65% for equivalent to secondary) consistent with 40 CFR Part 133?	X		
a. If no, does the record indicate that application of WQBELs, or some other means, results in more stringent requirements than 85% removal or that an exception consistent with 40 CFR 133.103 has been approved?	X		
3. Are technology-based permit limits expressed in the appropriate units of measure (e.g., concentration, mass, SU)?	X		
4. Are permit limits for BOD and TSS expressed in terms of both long term (e.g., average monthly) and short term (e.g., average weekly) limits?	X		
5. Are any concentration limitations in the permit less stringent than the secondary treatment requirements (30 mg/l BOD5 and TSS for a 30-day average and 45 mg/l BOD5 and TSS for a 7-day average)?		X	
a. If yes, does the record provide a justification (e.g., waste stabilization pond, trickling filter, etc.) for the alternate limitations?			X

II.D. Water Quality-Based Effluent Limits	Yes	No	N/A
1. Does the permit include appropriate limitations consistent with 40 CFR 122.44(d) covering State narrative and numeric criteria for water quality?	X		
2. Does the fact sheet indicate that any WQBELs were derived from a completed and EPA approved TMDL?		X	
3. Does the fact sheet provide effluent characteristics for each outfall?	X		
4. Does the fact sheet document that a "reasonable potential" evaluation was performed?	X		
a. If yes, does the fact sheet indicate that the "reasonable potential" evaluation was performed in accordance with the State's approved procedures?	X		
b. Does the fact sheet describe the basis for allowing or disallowing in-stream dilution or a mixing zone?	X		
c. Does the fact sheet present WLA calculation procedures for all pollutants that were found to have "reasonable potential"?	X		
d. Does the fact sheet indicate that the "reasonable potential" and WLA calculations accounted for contributions from upstream sources (i.e., do calculations include ambient/background concentrations)?	X		
e. Does the permit contain numeric effluent limits for all pollutants for which "reasonable potential" was determined?	X		

II.D. Water Quality-Based Effluent Limits – cont.	Yes	No	N/A
5. Are all final WQBELs in the permit consistent with the justification and/or documentation provided in the fact sheet?	X		
6. For all final WQBELs, are BOTH long-term AND short-term effluent limits established?	X		
7. Are WQBELs expressed in the permit using appropriate units of measure (e.g., mass, concentration)?	X		
8. Does the record indicate that an "antidegradation" review was performed in accordance with the State's approved antidegradation policy?	X		

II.E. Monitoring and Reporting Requirements	Yes	No	N/A
1. Does the permit require at least annual monitoring for all limited parameters and other monitoring as required by State and Federal regulations?	X		
a. If no, does the fact sheet indicate that the facility applied for and was granted a monitoring waiver, AND, does the permit specifically incorporate this waiver?			
2. Does the permit identify the physical location where monitoring is to be performed for each outfall?	X		
3. Does the permit require at least annual influent monitoring for BOD (or BOD alternative) and TSS to assess compliance with applicable percent removal requirements?		X	
4. Does the permit require testing for Whole Effluent Toxicity?	X		

II.F. Special Conditions	Yes	No	N/A
1. Does the permit include appropriate biosolids use/disposal requirements?	X		
2. Does the permit include appropriate storm water program requirements?			X

II.F. Special Conditions – cont.	Yes	No	N/A
3. If the permit contains compliance schedule(s), are they consistent with statutory and regulatory deadlines and requirements?			X
4. Are other special conditions (e.g., ambient sampling, mixing studies, TIE/TRE, BMPs, special studies) consistent with CWA and NPDES regulations?	X		
5. Does the permit allow/authorize discharge of sanitary sewage from points other than the POTW outfall(s) or CSO outfalls [i.e., Sanitary Sewer Overflows (SSOs) or treatment plant bypasses]?		X	
6. Does the permit authorize discharges from Combined Sewer Overflows (CSOs)?		X	
a. Does the permit require implementation of the "Nine Minimum Controls"?			X
b. Does the permit require development and implementation of a "Long Term Control Plan"?			X
c. Does the permit require monitoring and reporting for CSO events?			X
7. Does the permit include appropriate Pretreatment Program requirements?	X		

II.G. Standard Conditions	Yes	No	N/A
1. Does the **permit** contain all 40 CFR 122.41 standard conditions or the State equivalent (or more stringent) conditions?	X		

List of Standard Conditions – 40 CFR 122.41

Duty to comply	Property rights	Reporting Requirements
Duty to reapply	Duty to provide information	Planned change
Need to halt or reduce activity	Inspections and entry	Anticipated noncompliance
not a defense	Monitoring and records	Transfers
Duty to mitigate	Signatory requirement	Monitoring reports
Proper O & M	Bypass	Compliance schedules
Permit actions	Upset	24-Hour reporting
		Other non-compliance

2. Does the permit contain the additional standard condition (or the State equivalent or more stringent conditions) for POTWs regarding notification of new introduction of pollutants and new industrial users [40 CFR 122.42(b)]?	X		

Part III. Signature Page

Based on a review of the data and other information submitted by the permit applicant, and the draft permit and other administrative records generated by the Department/Division and/or made available to the Department/Division, the information provided on this checklist is accurate and complete, to the best of my knowledge.

Name	Anna T. Westernik
Title	Environmental Specialist II
Signature	A T Westernik
Date	May 16, 2007

Attachment 2

March 2010
MEMORANDUM

TO: Virginia Institute of Marine Science (VIMS) Model for the Tidal Rappahannock File

FROM: Alison Thompson, Water Permitting -- NRO

SUBJECT: Virginia Institute of Marine Science Model for the Tidal Rappahannock.
Input Assumptions and Summaries through December 2009

This memo summarizes all of the VIMS model inputs, assumptions, and results made to date, documenting the use of and decisions reached with the model.

The last major update to the inputs to the model was dated January 2005. It was the model run for the expansion of the Little Falls Run STP from 8.0 MGD to 13.0 MGD. In addition, staff made changes to the VIMS point source inputs due to the regulatory initiatives regarding nutrient loadings to the Chesapeake Bay. This analysis accounted for the status of the nutrient regulations in January 2005. In August 2006, staff did a correction to the model for the Fredericksburg STP flow used for the nutrient loadings. The most recent work, and the basis for this memorandum, was done because DEQ received a modification request from Spotsylvania County to move 1.4 MGD flow from FMC to the Massaponax STP.

Background

Stafford County, Spotsylvania County, and the City of Fredericksburg funded a water quality model for the upper Rappahannock River estuary developed by the Virginia Institute of Marine Science (VIMS), entitled A Modeling Study of the Water Quality of the Upper Rappahannock River (VIMS Model). This model was approved by the State Water Control Board Director on December 6, 1991. This model is used to determine effluent limitations for new and expanded discharge requests in the upper Rappahannock River, from the fall line at Fredericksburg to the Rt. 301 Bridge in King George County. VIMS documentation of the model is contained in *A Modeling Study of the Water Quality of the Upper Rappahannock River*, October 1991. A copy of the report as well as the program and general correspondence is contained in the Department of Environmental Quality (DEQ) Northern Regional Office (NRO) Rappahannock Model File.

There are 32 river miles between the fall line and the Rt. 301 Bridge. The model divides this 32 mile segment of the river into 33 model segments (see Figure 1 for discharger locations). The following point source discharges are included in the current model run:

Segment 3:	Fredericksburg STP	VA0025127	4.5 MGD
Segment 4:	FMC WWTP	VA0068110	4.0 MGD
Segment 9:	Little Falls Run STP	VA0076392	13.0 MGD
	Massaponax STP	VA0025658	9.4 MGD
Segment 20:	Four Winds Campground	VA0060429	0.210 MGD
Segment 23:	Hopyard Farm WWTP	VA0089338	0.50 MGD
Segment 26:	Haymount STP	VA0089125	0.96 MGD

Regulations affecting the VIMS model inputs

The 2008 303(d)/305(b) Integrated Report (2008 IR) indicates that the tidal, freshwater portion of the Rappahannock River (which encompasses the entire extent of this model) is impaired for not meeting the aquatic life use due to low levels of dissolved oxygen. Specifically, an open water assessment of dissolved oxygen values during the summer season showed that the tidal, freshwater Rappahannock River (RPPTF) does not meet water quality standards. The total maximum daily load (TMDL) for this impairment is due by 2010, as part of the Chesapeake Bay wide TMDL to address excess nutrients and sediment affecting the Bay.

In addition, the 2008 IR also listed the tidal, freshwater Rappahannock River as impaired for not meeting the fish consumption use, due to elevated levels of Polychlorinated Biphenyls (PCBs) in fish tissue. The Virginia Department of Health issued a fish consumption advisory for the Rappahannock River below the fall line that limits American eel, blue catfish, carp, channel catfish, croaker, gizzard shad, and anadromous (coastal) striped bass consumption to no more than two meals per month. The affected area extends from the I-95 bridge above Fredericksburg downstream to the mouth of the river near Stingray Point, including its tributaries Hazel Run up to the I-95 bridge crossing and Claiborne Run up to the Route 1 bridge crossing. The TMDL study for this impairment is due by 2016.

Finally, the tidal, freshwater Rappahannock River, from the Route 1 bridge in Fredericksburg, downstream to the confluence with Mill Creek (near the Route 301 bridge crossing) is listed as impaired for not supporting the recreational use due to exceedances of the *E. coli* bacteria criterion. A TMDL was developed for the bacteria impairment in 2007-2008. The TMDL was approved by EPA on 05/05/2008.

As of the drafting of this memo, the preliminary 2010 303(d)/305(b) Integrated Assessment indicates that the open-water aquatic life sub-use (assessed using dissolved oxygen data) for the tidal, freshwater Rappahannock River is fully supporting. There is insufficient information to determine if the aquatic life sub-use for migratory fish spawning and nursery is being met; thus, the overall aquatic life use is also listed as having insufficient information to make an assessment.

Virginia has committed to protecting and restoring the Bay and its tributaries. Currently the Agency has developed nutrient water quality standards for the Bay and its tributaries, amended the Nutrient Policy (9 VAC 25-40-10) to govern the inclusion of technology-based, numerical nitrogen and phosphorus limits in VPDES permits, and a parallel effort updating and amending the Water Quality Management Planning (WQMP) regulation 9 VAC 25-720. The Water Quality Standards for the Bay were adopted in March 2005. The WQMP regulation includes Total Nitrogen and Total Phosphorus Wasteload Allocations for all Chesapeake Bay Program Significant Discharge List (CBP SDL) discharges.

The total phosphorous loadings based on the Nutrient Policy and/or from the WQMP for the applicable facilities are as follows:

Fredericksburg STP (4.5 MGD; 0.3 mg/L)	4,111 lb/year
FMC WWTP (5.4 MGD; 0.3 mg/L)	4,934 lb/year
Little Falls Run STP (8.0 MGD; 0.3 mg/L)	7,309 lb/year
Massaponax STP (8.0 MGD; 0.3 mg/L)	7,309 lb/year
Four Winds Campground (0.21 MGD)	640 lb/year. Not in the WQMP, but must meet 1.0 mg/L annual average
Haymount STP (0.96 MGD; 0.3 mg/L)	877 lb/year
Hopyard Farm WWTP (0.5 MGD; 0.3 mg/L)	457 lb/year

The total nitrogen loadings based on the Nutrient Policy and from the WQMP for the applicable facilities are as follows:

Fredericksburg STP (4.5 MGD; 4.0 mg/L)	54,819 lb/year
FMC WWTP (5.4 MGD; 4.0 mg/L)	65,784 lb/year
Little Falls Run STP (8.0 MGD; 4.0 mg/L)	97,458 lb/year
Massaponax STP (8.0 MGD; 4.0 mg/L)	97,458 lb/year
Four Winds Campground (0.21 MGD)	5100 lb/year. Not in the WQMP, but must meet 8.0 mg/L annual average
Haymount STP (0.96 MGD; 4.0 mg/L)	11,695 lb/year

Hopyard Farm WWTP (0.5 MGD; 4.0 mg/L) 6091 lb/year.

In addition to the nutrient initiatives, the changes to the Water Quality Standards for the Chesapeake Bay and tidal waters included criteria for dissolved oxygen, water clarity, chlorophyll a, and Designated Uses. The dissolved oxygen standard for migratory fish waters for the months of February through May is a 7-day mean of greater than of 6.0 mg/L. For the months of June through January, the minimum is 5.5 mg/L. These dissolved oxygen criteria apply to the upper tidal portion of the Rappahannock River.

RADCO 208 Plan

The Rappahannock Area Development Commission (RADCO) 208 Area Waste Treatment Management Plan was adopted in August 1977, was amended in September 1983, and was repealed in 2004. The loading allocations in it had to be maintained until the Plan was repealed. The loading allocations in the Plan were based on an old water quality model, AUTO$$, that was replaced in 1991 by the VIMS model.

The VIMS model has demonstrated that nutrients are the primary factor affecting water quality in the upper tidal Rappahannock River. Numerous runs of the model have demonstrated that cBOD is not as influential as the nutrients at the maximum permitted flows of each POTW. As such, cBOD loadings are permissible above the levels specified in the old RADCO Plan.

Model Timeline

To date the model has been run seven times, each being necessitated by a request for a flow increase or for a new discharge. The runs are as follows:

1. August 14, 1995	- expansion of Fredericksburg STP from 3.5 to 4.5 MGD - addition of 0.93 MGD Haymount STP in Caroline County
2. August 22, 1996	- addition of 0.25 MGD Hopyard Farm WWTP in King George County
3. March 17, 1997	- flow increase and production increase at White Packing
4. April 7, 1999	- expansion of Little Falls Run STP from 4.0 to 8.0 MGD - expansion of Massaponax STP from 6.0 to 8.0 MGD
5. December 1, 2000	- expansion of FMC WWTP from 4.0 to 5.4 MGD
6. April 29, 2003	- expansion of the proposed Hopyard Farm WWTP from 0.25 to 0.50 MGD.
7. January 26, 2005	-remove White Packing from Segment 26 since the facility is closed -correction of Haymount STP flow to 0.96 (previously was 0.93) -addition of 1.0-MGD Greenhost – Village Farms in King George County -expansion of Little Falls Run STP from 8.0 to 13.0 MGD -incorporation of the WQMP nutrient loadings for the Significant Dischargers
8. August 2006	- correct nutrient loadings for the City of Fredericksburg
9. December 2009	- shift 1.4 MGD flow from FMC to Massaponax (will now be 9.4 MGD) - change the distribution of the nitrogen species based on the data obtained from the Discharge Monitoring Reports.

The initial run on August 14, 1995, has been considered the background condition for the river segments. The VIMS files located at DEQ-NRO contain the supporting documentation for the original model inputs and the subsequent model runs. With each successive run of the model, all parameters had been kept constant except those affected by the request necessitating the model run. The most recent model runs affected a change to the nutrient loadings for all the dischargers. In the older model runs, staff used best professional judgment to determine the distribution of the three nitrogen species: Ammonia as Nitrogen, Total Kjeldahl Nitrogen, and Oxidized Nitrogen (Nitrate+Nitrite). The January 2010 run looked at actual performance data

from the four largest facilities and found that the old assumptions were not correct. The old assumptions were Ammonia as Nitrogen (25%), Total Kjeldahl Nitrogen (25%), and Oxidized Nitrogen (50%). The actual performance data from these larger facilities is Ammonia as Nitrogen (3%), Total Kjeldahl Nitrogen (37%), and Oxidized Nitrogen (60%).

Antidegradation Analysis

With each running of the model, and/or permit action concerning this section of the Rappahannock River, an antidegradation analysis has been conducted in accordance with the water quality standards and DEQ guidance. This is a difficult task since the assessment and designation of Tier I or Tier II waters is partially subjective given the narrative criteria of the standards, water quality data are not static, and waterbody boundaries are not well defined.

Since the onset of using this model, the established model segments have been used, by default, to define river sections into individual waterbodies for the antidegradation analysis. DEQ did not suggest or contend that these model segments should be used for other water quality management purposes. It was recognized that the river from the fall line down to the Rt. 301 Bridge could have been, and perhaps should have been, considered one waterbody segment. DEQ also acknowledged that this whole segment of the Rappahannock River could have been assessed as Tier I since it is considered nutrient enriched and turbid and therefore subject to corrective plans outlined in the *1999 Tributary Strategy for the Rappahannock River and Northern Neck Coastal Basins*. However, being uncertain DEQ elected to evaluate antidegradation, as through each of the model segments were actual distinct waterbodies. This approach was conservative in terms of protecting water quality and to date did not prove to be an undo burden to any of the dischargers.

Historically, four segments were identified as Tier II through this process: segment 16, segment 20, segment 23, and segment 26. Each was identified through separate permit actions that did not initially involve the VIMS model. When a segment was analyzed as Tier II, two parameters generally were assessed, ammonia and dissolved oxygen (DO). Ammonia levels were kept below the baselines and DO was kept to no lower than 0.2 mg/L of the concentration predicted in the August 14, 1995 background model run. The VIMS memo dated April 29, 2003 contains the historical summary and table of the baselines of the Tier determinations for each of the four segments.

During the January 2005 model run analysis, the entire Rappahannock River was determined to be Tier I. The previous determination of Tier II ratings for segments 16, 20, 23, and 26 were made with adherence to guidance with little best professional judgement by staff. It has been 10 years since the initial runs of the model and staff no longer believes it appropriate to assign a tier rating for each model segment. Staff believes it is best to rate the whole segment from the fall line to the Route 301 bridge as one segment. The nutrient enrichment problems of this segment, as evident by high turbidity, warrant a Tier I rating. Staff again makes this determination for the sole purpose of assigning permit limits. And since the Tier ratings have had very little influence on the results of the model, there is no measurable consequence to this change, and there is no need to continue to assess these segments (16, 20, 23, and 26) as being different from the whole river segment.

It should be noted that the predicted concentrations of dissolved oxygen and ammonia are significantly different in this current model run than what was considered the "background" concentrations. With the new loading allocations to the significant discharges in place, the model predicts that chlorophyll concentrations will be significantly less than what prior model runs have predicted and the artificially elevated levels of dissolved oxygen (nutrients stimulate chlorophyll growth and chlorophyll photosynthesis generates dissolved oxygen) are no longer predicted. Further discussion of chlorophyll a is found in the next section.

Total Phosphorus Loading Cap (historical perspective)

All of the above facilities discharge into the tidal freshwater Rappahannock River. This section of the river was formerly designated as nutrient enriched waters. Specifically, the Tidal freshwater Rappahannock River from the fall line to Buoy 44 near Leedstown, Virginia, including all tributaries to their headwaters that enter the tidal freshwater Rappahannock River were classified as nutrient enriched waters. All dischargers into nutrient enriched waters as designated in the Water Quality Standards for Nutrient Enriched Waters that were permitted before July 1, 1988, and that discharge 1 MGD or more were subject to the Policy for Nutrient Enriched Waters. This policy required facilities to meet a monthly average Total Phosphorus limitations of 2.0 mg/L and to monitor for monthly average Total Nitrogen concentration and loading values. The application of standards to protect nutrient enriched waters within the Chesapeake Bay watershed was replaced in Virginia by the aforementioned regulatory programs governing nutrient and sediment inputs into the Bay. Thus, the nutrient enriched waters designation was removed from the Water Quality Standards.

Based on the prior VIMS model runs, the chlorophyll a levels in the upper segments of the river in the Fredericksburg area approached 100 ug/L under design conditions. It is staff's best professional judgment that high chlorophyll a concentrations and the corresponding high alga growth mask dissolved oxygen depletion due to BOD loading. The model provides a 30-day average output and it is hypothesized that the elevating effect of the chlorophyll concentrations is more significant than the

depleting effect of the BOD loadings. If the model provided daily outputs, one could see the diurnal dissolved oxygen sag and super-saturation effects in an over-enriched system. Further, the model demonstrated that chlorophyll a concentrations increased with additional phosphorus (P) loadings. If P limits for the expanding STPs were based solely on the Nutrient Policy, 2 mg/L, then chlorophyll a levels would exceed 120 ug/L in the waters around the City of Fredericksburg. To prevent further increases in chlorophyll a concentrations in this part of the river, total phosphorus loadings (mass based, kg/day) were not allowed to increase for the Fredericksburg, FMC, Massaponax, and Little Falls Run wastewater treatment plants beyond the current limits. All future requests for flow increases at these facilities required that the P mass limits remain constant at the current loading limits. Permitted phosphorus concentration limits may remain at the same level prescribed by the Nutrient Policy, 2 mg/L, since it is the total mass loading that impacts chlorophyll levels. However, as effluent flows increase, in order to meet the mass limitations, effluent concentrations had to be below the 2 mg/L limit.

The relationship of how chlorophyll photosynthesis affects dissolved oxygen levels has been explored in this model and it was worth recognizing what historical baseline/initial levels were. These values were useful in the subsequent model runs for tracking how nutrients inflated dissolved oxygen levels (nutrients stimulate chlorophyll growth and chlorophyll photosynthesis generates dissolved oxygen).

DEQ has adopted a chlorophyll a narrative standard at 9VAC25-260-185 that states, "Concentrations of chlorophyll a in free-floating microscopic aquatic plants (algae) shall not exceed levels that result in undesirable or nuisance aquatic plant life, or render tidal waters unsuitable for the propagation and growth of a balanced, indigenous population of aquatic life or otherwise result in ecologically undesirable water quality conditions such as reduced water clarity, low dissolved oxygen, food supply imbalances, proliferation of species deemed potentially harmful to aquatic life or humans or aesthetically objectionable conditions."

Summary of past model runs

In the 1995 VIMS model, the winter inputs for ammonia and organic nitrogen for all wastewater treatment plants were 14 mg/L ammonia and 14 mg/L organic nitrogen. These values represented little to no nitrification. The model indicated that there were no far field violations of the winter ammonia standards. Therefore, no winter ammonia or TKN limits were established for Fredericksburg, FMC, Massaponax, and Little Falls Run wastewater treatment plants. The acute ammonia criterion for the winter months was 12.07 mg/L. DEQ did not impose winter acute based ammonia limits on any of the treatment plants for the following reasons: the discharges are located near the fall line where tidal influences are the smallest; the net advective flow of the river dominates the tidal influence; the design flows are much smaller than the critical flows of the river; ammonia decays rather rapidly; and each of the plants were achieving varying degrees of nitrification.

During the April 7, 1999 model run, winter ammonia loading had to be lowered for Little Falls Run and Massaponax from 14 mg/L to 12 mg/L in order to meet the antidegradation baselines in segment 23 and 26. Since organic nitrogen would also decrease during the nitrification process, its input into the model was also lowered to 12 mg/L for both dischargers. During this model run, the winter ammonia loadings for FMC were also lowered to 12 mg/L to meet the antidegradation baselines of segments 16, 23, and 26. At the new flows for FMC, water quality criteria and antidegradation baselines are still protective for the summer months of May – October. Since organic nitrogen would also decrease during the nitrification process, its input into the model was also lowered to 12 mg/L for FMC. Acute based ammonia limits were imposed at the new flows for the same reasons cited above. However, since the new model inputs were lower than the acute ammonia water quality standard of 12.07 mg/L, it was certain that the acute standard was protected in the winter.

In the December 1, 2000 model run, two minor data entry problems were corrected in conjunction with the expansion of FMC to 5.4 MGD. First, in the original model documentation memorandum of August 14, 1995, the assumption was made that total effluent nitrogen levels for these types of plants would be 30 mg/L, and that it would exist in the form of organic nitrogen, ammonia, and/or inorganic nitrogen depending on the facility's ability to nitrify. This can be seen on page 1 under the section "Assumptions for nitrogen". However, the value shown for the three separate nitrogen parts add up to 32 mg/L. It was felt that this was a simple oversight at the time. Additionally, during the April 7, 1999 model run, nitrate-nitrite levels were increased to 21 mg/L and 24 mg/L for the Little Falls Run and Massaponax dischargers respectively, even though the ammonia nitrogen levels were set at 12 mg/L. Therefore, in order to maintain the original model assumptions, winter nitrate input levels were reset to 6 mg/L during this run for Little Falls Run, Massaponax, and FMC. Since the Fredericksburg inputs had not been adjusted, nor had they recently been adjusted, the original values were maintained (14 mg/L organic-N, 14 mg/L Ammonia-N, and 4 mg/L Nitrate/Nitrite). Second, the ammonia loadings for the Haymount STP were incorrectly entered as 8.61 kg/d. The correct loading was entered as 3.53 kg/d. This correction had little to no impact on the model outputs.

In the April 29, 2003, model run all numerical criteria were met and all antidegradation baselines for ammonia and DO were met except for one. In the winter run, segment 23 (Hopyard Farm) yielded a DO of 7.43 mg/L. The baseline for DO in this segment is 7.47 mg/L. In order to maintain the additional 0.04 mg/L of DO, the BOD concentrations of Hopyard Farm and the upstream dischargers would have to be significantly reduced. DEQ did not believe this reduction was warranted since the model was run based on design capacity flows for all facilities and not just for Hopyard Farm. In addition, the DO deficit for segment 23 actually improved from 0.07 mg/L to 0.04 mg/L with the increase in Hopyard Farm's flows. Therefore, changes to the effluent limits were not necessary for such a small change in DO since the model is not that sensitive or accurate.

In January 2005, the model run was conducted to include the expansion of the Little Falls Run STP, the removal of White Packing, the correction of the Haymount STP flow, and the addition of Greenhost – Village Farms because of observed nutrient concentrations in the discharge. This model run also assumed that the Nutrient Policy and the WQMP regulation were adopted. Effluent loadings for $cBOD_5$ and Dissolved Oxygen were derived by multiplying the current concentration limits by the maximum permitted flow. For the facilities that are contained in the draft WQMP regulation, nutrient loadings were derived using the flows and loadings presented in draft regulation. For Four Winds Campground, nutrient loadings were derived using a total nitrogen concentration of 8.0 mg/L and a total phosphorus concentration of 1.0 mg/L based on the draft Nutrient Policy. For Hopyard Farm WWTP, nutrient loadings were derived using a total nitrogen concentration of 4.0 mg/L and a total phosphorus concentration of 0.3 mg/L based on what was the draft WQMP. Best professional judgement and actual effluent data were used to determine the loadings for Greenhost- Village Farms. There was a small excursion of the Migratory fish spawning an nursery dissolved oxygen concentration of $\geq$6 mg/L; the excursion was 5.6 mg/L. Staff did not change the BOD limits for the dischargers but recommended increased ambient monitoring of the upper tidal Rappahannock River.

Current Model Run Summary

The model was run for the summer (May- October) period because this is the most critical time and when potential dissolved oxygen excursions have been noted during past model analyses. Historically, no problems have been noted with chlorophyll or dissolved oxygen in the winter runs. It should be noted that before the model runs could be fully analyzed and other scenarios attempted, the computer that this model runs on began to fail. The older programming (Leahy Fortran) used for the VIMS model no longer runs on the newer computers. Therefore, additional modeling cannot be performed without updating the code of the VIMS model.

Summer continues to be the critical period for the water quality of the upper tidal freshwater Rappahannock River because stream flows are typically lower and the dischargers have a greater influence on the water quality in the river, and alga growth is higher during the warmer temperatures of the summer months.

Staff ran a baseline run for the summer with Massaponax at 8 MGD; the baseline run did have the nitrogen allocations changed to reflect actual effluent characteristics, as discussed above. Model runs were also done with Massaponax at 9.4 MGD, Massaponax at 9.4 MGD and all facilities meeting the WQMP conditions, all FMC flow moved to Massaponax, and all flow from FMC and the City of Fredericksburg moved to Massaponax.

Chlorophyll a & Nutrients

When the WQMP is fully implemented, the model predicts chlorophyll a levels to drop substantially even when all the dischargers are at full capacity. The WQMP essentially reduces and places total nitrogen and total phosphorus loading caps on the significant dischargers. By removing the WWTP nutrient food sources for the algae, alga populations fall and thus, chlorophyll a levels are reduced. As noted earlier in this memorandum, staff also reallocated the nitrogen species based on the performance of the upgraded facilities. This also changed the output predictions from former analyses. It is staff's best professional judgment that moving the 1.4 MGD flow from FMC to Massaponax will not have any negative effects on the chlorophyll a and nutrient concentrations in the River.

Dissolved Oxygen

Class II tidal waters in the Chesapeake Bay and it tidal tributaries must meet dissolved oxygen concentrations as specified in 9VAC25-260-185. In the Northern Virginia area, Class II waters must meet the Migratory Fish Spawning and Nursery Designated Use from February 1 through May 31. For the remainder of the year, these tidal waters must meet the Open Water use.

Designated Use	Criteria Concentration/Duration	Temporal Application
Migratory fish spawning and nursery	7-day mean > 6 mg/L (tidal habitats with 0-0.5 ppt salinity)	February 1 – May 31
	Instantaneous minimum > 5 mg/L	
Open-water[1,2]	30-day mean > 5.5 mg/L (tidal habitats with 0-0.5 ppt salinity) 30-day mean > 5 mg/L (tidal habitats with >0.5 ppt salinity)	Year-round
	7-day mean > 4 mg/L	
	Instantaneous minimum > 3.2 mg/L at temperatures < 29°C Instantaneous minimum > 4.3 mg/L at temperatures > 29°C	
	1-day mean > 2.3 mg/L	
	Instantaneous minimum > 1.7 mg/L	

[1]See subsection aa of 9 VAC 25-260-310 for site specific seasonal open-water dissolved oxygen criteria applicable to the tidal Mattaponi and Pamunkey Rivers and their tidal tributaries.

[2]In applying this open-water instantaneous criterion to the Chesapeake Bay and its tidal tributaries where the existing water quality for dissolved oxygen exceeds an instantaneous minimum of 3.2 mg/L, that higher water quality for dissolved oxygen shall be provided antidegradation protection in accordance with section 30 subsection A.2 of the Water Quality Standards.

The model results show protection of the dissolved oxygen criteria except for the month of May in several segments. The current temporal application of the dissolved oxygen standards is different than the temporal application of the model, i.e., May is classified in the summer period. The migratory fish spawning and nursery Designated Use also looks at a 7-day mean, but the model only has a 30-day output. At this time, staff does not feel any changes are necessary to the cBOD limits for the dischargers because:

1) The excursion is very small; 5.6 mg/L is the predicted concentration in segment 13 when the Massaponax flow is at 9.4 and all facilities are at the WQMP loadings and concentrations.
2) The model is not that accurate to warrant substantial changes to the STPs to achieve such a small difference in dissolved oxygen. The accuracy of the model is questionable since it was developed over 20 years ago.
3) The model assumes May to be like July, August, and September, when in fact it is not, i.e., the water temperature is cooler and the background flows are higher.

VIMS Model

Due to the age of the model and the development and changes that have occurred in the localities, staff will also inform the localities that any additional changes to design flows will require an update to the VIMS model. Staff recommends that the following be considered when the model is updated:

1) The model currently provides only a 30-day average output. It would be useful to have the ability to generate hourly, daily or other shorter averaging periods. A more refined model will allow better understanding of the relationships between DO, chlorophyll a, BOD, and nutrients.
2) Consider land use and hydrologic changes that have occurred and the associated changes to water flow, quantity and quality dynamics, especially since the Embry Dam has been removed from the River.

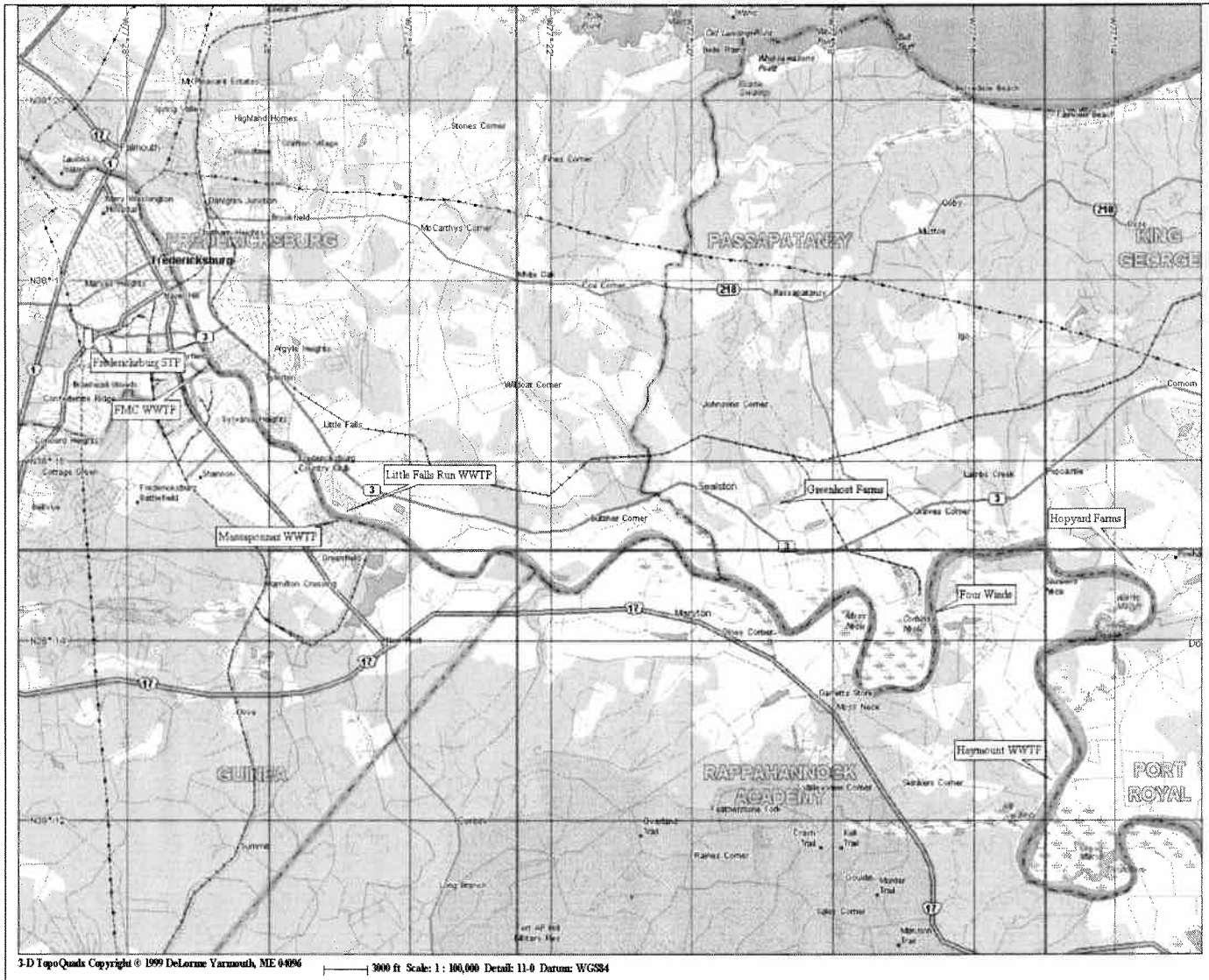


Figure 1
Discharger Locations

Table 1
Current Model Associated Limits for All Dischargers in VIMS Model

Discharger Permit No.	Fredericksburg VA0025127	FMC VA0068110	Little Falls Run VA0076392	Massaponax VA0025658	Four Winds VA0060429	Hopyard Farm VA0089338	Haymount VA0089125
Segment	3	4	9	9	20	23	26
River Mile	108.64	107.37	104.61	104.67	92.2	89.8	85.10
Flow (MGD)	4.5	5.4	13.0	9.4	0.210	0.50	0.96
BOD5 (mg/L, kg/d)	N/A	N/A	N/A	N/A	30/23.8	30/56.77	N/A
cBOD5 (mg/L, kg/d)	13.0 / 221	15.0 / 306.6	9.0 /440	10.0 / 356	N/A	N/A	10.0 / 36
TKN (summer) (mg/L, kg/d)	7.0 /119.23	3.0 / 61.3	6.0 /295	9.0 / 320	2.29/1.82	N/A	3.0 / 10.9
TKN (winter) (mg/L, kg/d)	NL	N/A	NL	NL	3.41/2.71	N/A	N/A
Ammonia (summer) (mg/L, kg/d)	N/A	N/A	4.7	N/A	N/A	10.7/20.2	N/A
Ammonia (winter) (mg/L, kg/d)	N/A	N/A	4.7	12.0 / 427	N/A	12.4/23.4	N/A
Total Phosphorous (kg/d)	26.5	30.3	30.3	45.4	1.59	3.78	7.3
Dissolved Oxygen (mg/L)	6.0	6.0	6.0	6.0	6.0	6.0	6.0

N/A – Not Applicable
NL – No Limit

PUBLIC NOTICE – MODIFICATION OF AN ENVIRONMENTAL PERMIT

PURPOSE OF NOTICE: To seek public comment on a draft permit from the Department of Environmental Quality that will allow the release of treated wastewater into a water body in Spotsylvania County.

PUBLIC COMMENT PERIOD: June 29, 2010 to 5:00 p.m. on July 28, 2010

PERMIT NAME: Virginia Pollutant Discharge Elimination System Permit – Wastewater issued by DEQ, under the authority of the State Water Control Board

APPLICANT NAME, ADDRESS AND PERMIT NUMBER: Spotsylvania County
600 Hudgins Road
Fredericksburg, VA 22408
VA0025658

NAME AND ADDRESS OF FACILITY: Massaponax Wastewater Treatment Facility
10900 HCC Drive, Routes 2 & 17
Fredericksburg, VA 22408

PROJECT DESCRIPTION: DEQ proposes to modify the VPDES permit for the Massaponax WWTF in Spotsylvania County Virginia. The applicant proposes release of treated sewage at a rate of 9.4 Million Gallons per Day into the Rappahannock River in Spotsylvania County that is in the Rappahannock River Watershed. A watershed is the land area drained by a river and its incoming streams. The sludge will be composted. The permit limits or monitors the following pollutants to amounts that protect water quality: Flow, pH, $cBOD_5$, Total Suspended Solids, Total Phosphorus, *E. coli* bacteria, Dissolved Oxygen, Ammonia as Nitrogen, Total Kjeldahl Nitrogen, Nitrate and Nitrite as Nitrogen, Total Nitrogen, and Total Residual Chlorine: The facility is subject to the requirements of 9 VAC 25-820 and has registered for coverage under the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia. The permit modification will allow the addition of a 9.4 MGD design flow tier.

HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING -- DEQ accepts comments and requests for public hearing by e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief informal statement regarding the nature and extent of the interest of the requester or of those represented by the requestor, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. DEQ may hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit

CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION: The public may review the documents at the DEQ-Northern Virginia Regional Office every work day by appointment or may request a copy by calling or e-mailing the contact individual below.
Name: Anna T. Westernik
Address: DEQ-Northern Virginia Regional Office, 13901 Crown Court, Woodbridge, VA 22193
Phone: (703) 583-3837 E-mail: anna.westernik@deq.virginia.gov Fax: (703) 583-3821

Attachment 3

Revised 2/2003

State "Transmittal Checklist" to Assist in Targeting
Municipal and Industrial Individual NPDES Draft Permits for Review

Part I. State Draft Permit Submission Checklist

In accordance with the MOA established between the Commonwealth of Virginia and the United States Environmental Protection Agency, Region III, the Commonwealth submits the following draft National Pollutant Discharge Elimination System (NPDES) permit for Agency review and concurrence.

Facility Name:	Massaponax WWTF – Permit Modification
NPDES Permit Number:	VA0025658
Permit Writer Name:	Anna T. Westernik
Date:	April 1, 2010

Major [X] **Minor** [ ] **Industrial** [ ] **Municipal** [X]

I.A. Draft Permit Package Submittal Includes:	**Yes**	**No**	**N/A**
1. Permit Application?			X
2. Complete Draft Permit (for renewal or first time permit – entire permit, including boilerplate information)?			X
3. Copy of Public Notice?	X		
4. Complete Fact Sheet?			X
5. A Priority Pollutant Screening to determine parameters of concern?			X
6. A Reasonable Potential analysis showing calculated WQBELs?			X
7. Dissolved Oxygen calculations?			X
8. Whole Effluent Toxicity Test summary and analysis?			X
9. Permit Rating Sheet for new or modified industrial facilities?			X

I.B. Permit/Facility Characteristics	**Yes**	**No**	**N/A**
1. Is this a new, or currently unpermitted facility?		X	
2. Are all permissible outfalls (including combined sewer overflow points, non-process water and storm water) from the facility properly identified and authorized in the permit?	X		
3. Does the fact sheet **or** permit contain a description of the wastewater treatment process?	X		
4. Does the review of PCS/DMR data for at least the last 3 years indicate significant non-compliance with the existing permit?		X	
5. Has there been any change in streamflow characteristics since the last permit was developed?		X	
6. Does the permit allow the discharge of new or increased loadings of any pollutants?		X	
7. Does the fact sheet **or** permit provide a description of the receiving water body(s) to which the facility discharges, including information on low/critical flow conditions and designated/existing uses?	X		
8. Does the facility discharge to a 303(d) listed water?	X		
a. Has a TMDL been developed and approved by EPA for the impaired water?		X	
b. Does the record indicate that the TMDL development is on the State priority list and will most likely be developed within the life of the permit?	X		
c. Does the facility discharge a pollutant of concern identified in the TMDL or 303(d) listed water?	X		
9. Have any limits been removed, or are any limits less stringent, than those in the current permit?		X	
10. Does the permit authorize discharges of storm water?		X	

Attachment 4

I.B. Permit/Facility Characteristics – cont.	Yes	No	N/A
11. Has the facility substantially enlarged or altered its operation or substantially increased its flow or production?		X	
12. Are there any production-based, technology-based effluent limits in the permit?		X	
13. Do any water quality-based effluent limit calculations differ from the State's standard policies or procedures?		X	
14. Are any WQBELs based on an interpretation of narrative criteria?		X	
15. Does the permit incorporate any variances or other exceptions to the State's standards or regulations?		X	
16. Does the permit contain a compliance schedule for any limit or condition?		X	
17. Is there a potential impact to endangered/threatened species or their habitat by the facility's discharge(s)?		X	
18. Have impacts from the discharge(s) at downstream potable water supplies been evaluated?	X		
19. Is there any indication that there is significant public interest in the permit action proposed for this facility?		X	
20. Have previous permit, application, and fact sheet been examined?	X		

Part II. NPDES Draft Permit Checklist

Region III NPDES Permit Quality Checklist – for POTWs

(To be completed and included in the record only for POTWs)

II.A. Permit Cover Page/Administration	**Yes**	**No**	**N/A**
1. Does the fact sheet or permit describe the physical location of the facility, including latitude and longitude (not necessarily on permit cover page)?	X		
2. Does the permit contain specific authorization-to-discharge information (from where to where, by whom)?	X		

II.B. Effluent Limits – General Elements	**Yes**	**No**	**N/A**
1. Does the fact sheet describe the basis of final limits in the permit (e.g., that a comparison of technology and water quality-based limits was performed, and the most stringent limit selected)?	X		
2. Does the fact sheet discuss whether "antibacksliding" provisions were met for any limits that are less stringent than those in the previous NPDES permit?	X		

II.C. Technology-Based Effluent Limits (POTWs)	**Yes**	**No**	**N/A**
1. Does the permit contain numeric limits for ALL of the following: BOD (or alternative, e.g., CBOD, COD, TOC), TSS, and pH?	X		
2. Does the permit require at least 85% removal for BOD (or BOD alternative) and TSS (or 65% for equivalent to secondary) consistent with 40 CFR Part 133?	X		
a. If no, does the record indicate that application of WQBELs, or some other means, results in more stringent requirements than 85% removal or that an exception consistent with 40 CFR 133.103 has been approved?			X
3. Are technology-based permit limits expressed in the appropriate units of measure (e.g., concentration, mass, SU)?	X		
4. Are permit limits for BOD and TSS expressed in terms of both long term (e.g., average monthly) and short term (e.g., average weekly) limits?	X		
5. Are any concentration limitations in the permit less stringent than the secondary treatment requirements (30 mg/l BOD5 and TSS for a 30-day average and 45 mg/l BOD5 and TSS for a 7-day average)?		X	
a. If yes, does the record provide a justification (e.g., waste stabilization pond, trickling filter, etc.) for the alternate limitations?			X

II.D. Water Quality-Based Effluent Limits	**Yes**	**No**	**N/A**
1. Does the permit include appropriate limitations consistent with 40 CFR 122.44(d) covering State narrative and numeric criteria for water quality?	X		
2. Does the fact sheet indicate that any WQBELs were derived from a completed and EPA approved TMDL?		X	
3. Does the fact sheet provide effluent characteristics for each outfall?	X		
4. Does the fact sheet document that a "reasonable potential" evaluation was performed?	X		
a. If yes, does the fact sheet indicate that the "reasonable potential" evaluation was performed in accordance with the State's approved procedures?	X		
b. Does the fact sheet describe the basis for allowing or disallowing in-stream dilution or a mixing zone?	X		
c. Does the fact sheet present WLA calculation procedures for all pollutants that were found to have "reasonable potential"?	X		
d. Does the fact sheet indicate that the "reasonable potential" and WLA calculations accounted for contributions from upstream sources (i.e., do calculations include ambient/background concentrations)?	X		
e. Does the permit contain numeric effluent limits for all pollutants for which "reasonable potential" was determined?	X		

II.D. Water Quality-Based Effluent Limits – cont.	Yes	No	N/A
5. Are all final WQBELs in the permit consistent with the justification and/or documentation provided in the fact sheet?	X		
6. For all final WQBELs, are BOTH long-term AND short-term effluent limits established?	X		
7. Are WQBELs expressed in the permit using appropriate units of measure (e.g., mass, concentration)?	X		
8. Does the record indicate that an "antidegradation" review was performed in accordance with the State's approved antidegradation policy?	X		

II.E. Monitoring and Reporting Requirements	Yes	No	N/A
1. Does the permit require at least annual monitoring for all limited parameters and other monitoring as required by State and Federal regulations?	X		
a. If no, does the fact sheet indicate that the facility applied for and was granted a monitoring waiver, AND, does the permit specifically incorporate this waiver?			
2. Does the permit identify the physical location where monitoring is to be performed for each outfall?	X		
3. Does the permit require at least annual influent monitoring for BOD (or BOD alternative) and TSS to assess compliance with applicable percent removal requirements?		X	
4. Does the permit require testing for Whole Effluent Toxicity?	X		

II.F. Special Conditions	Yes	No	N/A
1. Does the permit include appropriate biosolids use/disposal requirements?	X		
2. Does the permit include appropriate storm water program requirements?			X

II.F. Special Conditions – cont.	Yes	No	N/A
3. If the permit contains compliance schedule(s), are they consistent with statutory and regulatory deadlines and requirements?			X
4. Are other special conditions (e.g., ambient sampling, mixing studies, TIE/TRE, BMPs, special studies) consistent with CWA and NPDES regulations?	X		
5. Does the permit allow/authorize discharge of sanitary sewage from points other than the POTW outfall(s) or CSO outfalls [i.e., Sanitary Sewer Overflows (SSOs) or treatment plant bypasses]?		X	
6. Does the permit authorize discharges from Combined Sewer Overflows (CSOs)?		X	
a. Does the permit require implementation of the "Nine Minimum Controls"?			X
b. Does the permit require development and implementation of a "Long Term Control Plan"?			X
c. Does the permit require monitoring and reporting for CSO events?			X
7. Does the permit include appropriate Pretreatment Program requirements?	X		

II.G. Standard Conditions	Yes	No	N/A
1. Does the **permit** contain all 40 CFR 122.41 standard conditions or the State equivalent (or more stringent) conditions?	X		

List of Standard Conditions – 40 CFR 122.41

Duty to comply	Property rights	Reporting Requirements
Duty to reapply	Duty to provide information	Planned change
Need to halt or reduce activity not a defense	Inspections and entry	Anticipated noncompliance
Duty to mitigate	Monitoring and records	Transfers
Proper O & M	Signatory requirement	Monitoring reports
Permit actions	Bypass	Compliance schedules
	Upset	24-Hour reporting
		Other non-compliance

2. Does the permit contain the additional standard condition (or the State equivalent or more stringent conditions) for POTWs regarding notification of new introduction of pollutants and new industrial users [40 CFR 122.42(b)]?	X		

Part III. Signature Page

Based on a review of the data and other information submitted by the permit applicant, and the draft permit and other administrative records generated by the Department/Division and/or made available to the Department/Division, the information provided on this checklist is accurate and complete, to the best of my knowledge.

Name	Anna T. Westernik
Title	Environmental Specialist II
Signature	A T Westernik
Date	April 1, 2010